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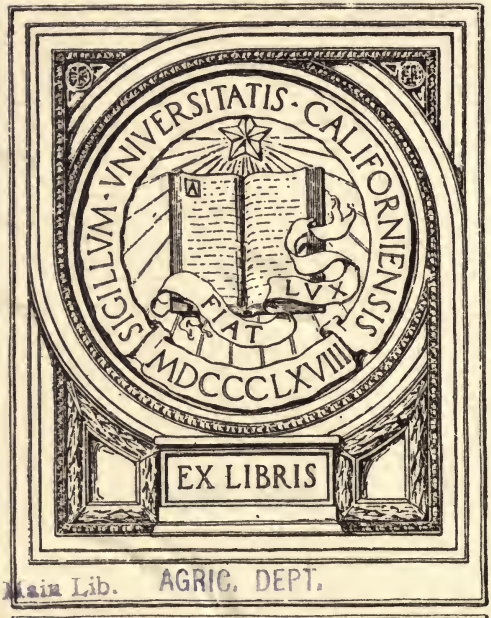

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U. S. DEPARTMENT OF AGRICULTURE.

BUREAU OF PLANT INDUSTRY—BULLETIN NO. 92.

B. T. GALLOWAY, *Chief of Bureau.*

DATE VARIETIES AND DATE CULTURE IN TUNIS.

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BY

THOMAS H. KEARNEY,

PHYSIOLOGIST, PLANT BREEDING INVESTIGATIONS.

ISSUED SEPTEMBER 6, 1906.

WASHINGTON:

GOVERNMENT PRINTING OFFICE.

1906.

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[Continued on page 3 of cover.]

HARVESTING DEGLET NOOR DATES AT TOZER.

(From a photograph by F. Soler, Tunis.)

U. S. DEPARTMENT OF AGRICULTURE.
BUREAU OF PLANT INDUSTRY—BULLETIN NO. 92.
B. T. GALLOWAY, *Chief of Bureau.*

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LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Bureau of Plant Industry,
Office of the Chief,
Washington, D. C., March 1, 1906.

Sir: I have the honor to transmit herewith, and to recommend for publication as Bulletin No. 92 of the series of this Bureau, the accompanying manuscript, entitled "Date Varieties and Date Culture in Tunis," by Thomas H. Kearney, Physiologist, Plant Breeding Investigations.

The importance of this bulletin lies in the fact that it presents a key to the principal varieties of date palms—the first available to Americans interested in this fruit. It gives, further, an accurate picture of the conditions under which profitable date culture is carried on in the northern edge of the Sahara, and can not fail to be of value to all prospective date growers.

Acknowledgment is made of the courteous cooperation uniformly extended to Mr. Kearney by the authorities during his stay in Tunis. The valuable assistance rendered him by M. Hugon, director of agriculture and commerce, and by MM. Chervin, Minangoin, and Tellier, of the direction of agriculture, as well as by the contrôleurs civils at Tozer, Gafsa, Sfax, and Gabes, and by the caids of Tozer and Kebili, should be especially mentioned. The hospitality extended by Captain Donau, commandant supérieur at Kebili, and the great service rendered by him to the Department of Agriculture in having collected, prepared, and forwarded to Tozer 175 offshoots of the best varieties found in the Nefzaoua, merit especial acknowledgment. Prof. Milton Whitney, Chief of the Bureau of Soils, and Drs. F. K. Cameron and L. J. Briggs, of that Bureau, obligingly cooperated in furnishing mechanical analyses of the soil samples collected and chemical analyses of the soil and water samples.

This paper has been submitted by the Botanist in Charge of Seed and Plant Introduction and Distribution, and was prepared as a result of Mr. Kearney's expedition to the oases of Tunis in search of new varieties of dates.

The illustrations which accompany this paper are considered essential to a full understanding of the text.

Respectfully,

B. T. Galloway,
Chief of Bureau.

Hon. James Wilson,
Secretary of Agriculture.

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DATE VARIETIES AND DATE CULTURE IN TUNIS.

INTRODUCTION.

During the autumn and winter of 1904–5, while traveling as agricultural explorer for the Office of Seed and Plant Introduction and Distribution, the writer, at the suggestion of Mr. W. T. Swingle, made two trips to the oases of southern Tunis in order to study the varieties of the date palm grown there and to secure offshoots of the more promising sorts for introduction into the United States. The first visit was made in October and November, the period when the fruits of most of the varieties are ripening and when the harvest is in full progress. On that occasion six weeks were spent in the more important oases, and a careful study of the chief varieties was made. This was considered an essential preliminary to selecting varieties for importation, as very little has been done by Europeans in studying the characters of the almost innumerable varieties of the date palm and in ascertaining the relative merits of the different kinds.

Nowhere, perhaps, does a greater number of promising varieties occur within a restricted area than in these Tunis oases, and the opportunity for comparison of widely differing types was an exceptionally good one. In the course of the investigations a collection of 97 samples, representing 93 distinct varieties, was obtained. Descriptions of 105 varieties were drawn up on the spot from freshly gathered fruits, and in many cases the characters of the palms themselves were noted. The fruits of 85 varieties were photographed in natural size, and photographs of the trees of 34 varieties were made.

Much information was obtained regarding the fruits of the different varieties, their size, appearance, sweetness, flavor, time of ripening, productiveness, and keeping qualities. The season chosen for the visit allowed the interesting process of harvesting the dates to be observed. Attention was also paid to the subjects of irrigation, cultural methods, and of saline or "alkali" soils in relation to the date palm.

As a result of the first visit to the oases, it was possible for the writer to decide upon the varieties that seemed most desirable for introduction into the southwestern United States. To procure these varieties a second trip to the region was made for the Office of Seed and Plant Introduction and Distribution in February, 1905, and three weeks were spent in collecting and packing the offshoots. In all about 700 offshoots, representing 56 varieties, were obtained, and it required a caravan of 90 camels to transport them to the railway.

The importation of so large a number of varieties was thought desirable, because it was recognized that date culture in the United States is still in the experimental stage, and it is impossible to foresee as yet what varieties will prove most satisfactory. It is quite possible that some of those which thrive best and are most esteemed in their native countries will not succeed with us. On the other hand, varieties that are less esteemed at home may develop valuable qualities when transplanted to this continent. Furthermore, in view of the great diversity of climate and soil existing in the parts of the United States where date culture is possible, it seems altogether probable that different kinds will be found adapted to different sections. In that case the existence at some few central points in the Southwest of large collections of varieties will prove to be of cardinal importance in the development of this promising industry.

For these reasons, an effort was made to secure a few suckers of every well-marked variety of any value, while, of course, especial endeavor was directed to securing a larger number of each of the finest and most highly esteemed sorts. In a few cases the latter aim was not realized, owing to the rarity of the palms and the reluctance of the natives to part with the suckers. Of the superb Menakher date, for example, one of the principal objects of the expedition, only nine offshoots could be obtained, and most of these were smaller than could be wished. Yet at least a few offshoots were imported of all but one variety of primary value, and only two or three of the varieties that were regarded as of secondary value are wanting in the collection. It might be added that at the time of writing (October 1, 1905) from 75 to 95 per cent of the palms imported from Tunis six months previously are showing signs of growth in the different plantations in Arizona and California.

The chief object of the present report is to furnish descriptions of the Tunisian varieties imported into the United States, so that they can be identified hereafter. It is recognized that owing to the large number of varieties that have been introduced during the past five years much confusion in regard to the identity of the different sorts is likely to arise unless some attempt is made to place their characters upon record. To this end a descriptive key has been

worked out, which it is believed will be found useful in identifying the Tunisian varieties. As nothing of the kind has heretofore been attempted so far as the date palm is concerned, it is hoped that, besides fulfilling its immediate object, this key will afford suggestions as to the characters that are most serviceable in distinguishing the varieties and will serve as a basis for future studies.

To supplement the descriptions contained in the key, each of the varieties imported is discussed under the headings "Varieties of primary importance," "Varieties of secondary importance," "Varieties of minor importance," and "Varieties imported but not included in the key," with respect to the quality of the fruit, time of ripening, productiveness, trunk and foliage characters, resistance to alkali, etc.

As an introduction to the study of the varieties, the important geographical and climatic features of the region are treated, together with the character of the water supply and the cultural methods in use.

CHARACTERISTICS OF THE REGION.

GEOGRAPHY.

The principal oases of southern Tunis, in which the date palm is the chief culture, form four distinct groups, the Jerid, the Nefzaoua, Gabes, and Gafsa, each group being separated from the others by wide expanses of desert. (See fig. 1.) Each group differs in many important features from the others, having its special peculiarities of climate, soil, and water supply, as well as its characteristic varieties of dates.

The Jerid is for us by far the most important group of oases, for there are found in perfection some of the finest varieties of the date palm in the world. It is the only part of Tunis in which the choice Deglet Noor dates are produced in large quantity for European markets, exporting annually from one and one-half to two and one-half million pounds of them. This report, therefore, deals chiefly with the Jerid oases. A brief account of each of the other groups is given in the present chapter, but the discussions of climate, water supply, soils, and culture of the date palm apply almost solely to the Jerid. When reference is made to some other region, it is especially designated.

THE JERID.

The name "Jerid" (French spelling, Djerid) is an abbreviation of "Beled-el-Jerid"—the "cities of date palms." The group consists of four oases—Nefta, Tozer, El Oudiane, and El Hamma—sep-

arated one from another by several miles of barren, sandy, or stony desert. They lie at the northern edge of the Sahara Desert, nestling at the foot of a line of cliffs that forms the north bank of the Shott Jerid. The Shott, which is about 68 miles long from west to east, is in winter a large, shallow salt lake, and in summer a mud flat, covered toward its center with a shining white crust of salt, much resembling, therefore, the Salton Sink in southeastern California. Its mean elevation is about 70 feet above sea level. Toward the northwest it opens into the Shott Gharsa, continued still farther westward as the

FIG. 1.—Map showing the location of the Tunis oases with respect to other localities in Algeria and Tunis.

Shott Melrhirh, which borders the Oued Rirh oases of Algeria.[a] Beyond the easternmost of the Jerid oases the Shott Jerid contracts into a strait, which connects it with the much narrower Shott-el-Fejej. The latter extends eastward to within a few miles of the sea, near Gabes.

Near its western end the Shott Jerid is bordered on the north by a barren, rocky line of bluffs of the pliocene formation, which farther

[a] See Bul. 80, Bureau of Plant Industry, U. S. Dept. of Agriculture, 1905, p. 18.

east rises into the Jebel Sherb range of mountains. This escarpment, known as the Draa-el-Jerid, runs nearly east and west. West of Nefta it ends in a promontory extending between the Shott Jerid and the Shott Gharsa. It is virtually the southern edge of an arid, generally stony plain, almost devoid of vegetation, which extends northward to Gafsa and beyond, rising gradually into the elevated plateau of central Tunis. This plain is intersected by desolate ranges of hills and by deep ravines that contain water only at long, irregular intervals.

At the southern base of the Draa-el-Jerid bluffs, and sloping toward the Shott Jerid, lie the three oases of Nefta, Tozer, and El Oudiane, the first being the westernmost. Tozer is 15 miles east of Nefta and El Oudiane about 6 miles east of Tozer. These three oases are well sheltered from the north wind by the terrace behind them, but lie open to the south. On the other hand, El Hamma, 5½ miles north of Tozer, lies on the northwestern side of the Draa-el-Jerid, having the Shott Gharsa to the west, and while protected on the south and east sides it is much exposed toward the north and west.

In general aspect all four oases are much alike. They consist of almost unbroken forests of date palms, divided up into many gardens that are separated by mud walls and intersected by innumerable irrigation and drainage ditches. The total number of date palms in the region is variously estimated at from 600,000 to 1,000,000. It has been estimated [a] that the average annual production of dates in the Jerid is about 34,700,000 pounds, of which somewhat more than 5 per cent are of the Deglet Noor variety. (See p. 63.) Of the total product of other varieties, about one-third is consumed on the spot, the rest being exported to various parts of northern Africa.

In the shade of the palms (Pls. I; V, fig. 2, and VI) are grown many other kinds of fruit trees—oranges, olives, figs, apricots, peaches, pomegranates, and jujubes—interlaced with large grapevines that often hang in festoons from the palm trunks. Beneath the trees are small plots of garden vegetables, barley, and alfalfa. Neither date palms nor other trees are planted with any regularity, and the growth is often so dense that the garden resembles a tropical jungle.

Very beautiful are these gardens in the spring, when the apricot and peach trees are in blossom here and there among the palms and the figs and vines are putting forth their leaves. In autumn, when the dates are ripening, the color effects, especially when the tops of the palms are lit up by the last rays of the setting sun, are some-

[a] By Dollin du Fresnel, Le Djérid Tunisien. Bul. de la Soc. de Géogr. Comm. 22: 38 (1900).

thing that once seen can never be forgotten. The great clusters of fruit, displaying every tint from bright yellow, through orange, vermilion, and maroon, to plum purple and chestnut brown, with their brilliant yellow or rich orange ivory-like stalks, contrast superbly with the dull bluish or gray green of the feathery crowns of foliage. It is small wonder that a whole folklore of poetic legends and proverbs has grown up around the date palm in the regions where it flourishes.[a]

The oases, especially Nefta, were formerly much exposed to the encroachment of the wind-blown sand of the desert, but since the French occupation the forestry service has taken effective measures to protect them from this danger. Around each oasis, at a distance from the edge of the gardens generally of 1,000 feet, although varying according to circumstances, a mud wall, surmounted by a fence of palm leaves, has been erected. The sand drifts against this, forming an artificial dune sloping outward. As fast as this dune increases in height, the palisade is built higher. The slopes of the dune itself are planted with tamarisks, retam, and other desert shrubs suitable for binding the sand. The zone between the palisade and the gardens is strictly forbidden to the domestic animals that were formerly pastured there, as they kept the soil in a loose condition and prevented the growth of the natural vegetation that helps to hold it in place. At the most exposed points a series of outer palisades, erected at regular intervals, arrests a good part of the sand before it can reach the barrier which is nearest the gardens.

[a] A number of these legends and beliefs are related by Charlet (Les Palmiers du Mzab, Bul. Soc. Géogr. d'Alger, 1905. Mohammed enjoined the care of the date palm as an almost religious duty, saying, "The palm is your aunt—the sister of your father Adam." He also spoke of the date as "the only fruit which has in heaven the same flavor as upon earth," and described in these glowing terms the palms that grow in paradise: "Trunks of gold, spathes of gold, branches of gold, leaves of gold, stalks of gold, petals of gold, fruits as large as buckets, softer than butter, sweeter than honey." Another Arab poet imagined thus the dates of paradise: "They will be whiter than milk, more transparent than honey, softer than butter; they will have no stones." The origin of the date palm is often the theme of Mohammedan writers. "When God had shaped Adam's body with his hands, a little of the earth which He had used to fashion in his image our first father stuck to his fingers. He rolled it between his hands, making from it the trunk of the palm." The Arabs profess to see many points of resemblance between the date palm and man, its friend and ally. "Like man, it holds up its head; like man, it has a companion of a different sex. Its heart (terminal bud), immaculately white, is as tender and delicate as the brain of a man, the least hurt causing its death. Like man, it fears cold. If one of its branches be cut off, it does not grow out again, and thus is like a man's limb. If one cuts off its head, it dies. The fiber (leef) that surrounds its head resembles human hair." The little circle, about 1.5 millimeters in diameter, that is found on the back of the stone is believed to be the impress of the seal of Solomon.

The Jerid region was evidently occupied by the Romans, and fragments of structures belonging to their epoch are frequently met with. Both Nefta (Nepte) and Tozer (Thusuros) are situated on or near the site of ancient Roman towns. Although frequently harried and pillaged by the nomadic Arabs and by other wild tribes of the desert, the oases of the Jerid have been, so far as we know, in a continuous state of cultivation throughout the Christian era. An Arab author of the eleventh century celebrated in glowing terms their fertility of soil and the beauty of their dense forests of date palms. "No other place in Africa," he wrote, "produces so many dates."

Until the completion of the railway from Sfax, on the east coast of Tunis, to the rich phosphate mines a few miles to the west of Gafsa (see map, fig. 1), the main artery of communication of the Jerid with the coast was the road, or rather trail, across the Shott Jerid, through the oases of the Nefzaoua, and then along the southern bank of the Shott-el-Fejej to Gabes, the total distance from Tozer to Gabes being about 120 miles. All the dates at that time exported from the Jerid to Europe had to be carried over this road by caravan. Now, however, Tozer is only about 35 miles from the end of the railway, and communication with the outside world is comparatively easy.

The total population of the Jerid oases is about 30,000, Tozer and Nefta each counting about 9,000 inhabitants. Practically this entire population is supported by date culture, as the other agricultural products of the oases are of so little importance as to be almost negligible and only a very small fraction of the population supports itself by manufacturing various fabrics.

Nefta, the most western oasis of the Jerid, is said to occupy over 6,000 acres. The number of date palms it contains is variously estimated at from 180,000 to 385,000, of which only 14,000 are said to be of the Deglet Noor variety.[a] The oasis consists of two distinct parts; on the north a deep basin, called by the French the "Corbeille" (basket), in which arise the springs that water the gardens, and on the south the fan-shaped larger portion, extending to the low salt flats that fringe the Shott Jerid. The town of Nefta (Pl. VI, fig. 3), the holy city of southern Tunis, lies between the two segments of the oasis and is itself separated into two parts by a deep ravine (shown in the foreground of Pl. VI, fig. 3). Through this ravine runs the stream that carries the waters of the springs from the "basket" to the lower part of the oasis. The palms that occupy the "basket" are of unusual beauty. It is said that a few years ago an English

[a] But by the same authority the total number of all kinds is given as only 180,000.

company made an unsuccessful attempt to purchase this part of the oasis.[a]

Better sheltered as it is than Tozer, especially on the north, and said to possess a more fertile soil, Nefta is well situated for date growing, and its palms yield fruit of high quality. Its gardens are celebrated for their beauty, containing many orange, apricot, fig, and other fruit trees, in addition to the date palms, which are largely of choice varieties. More vegetables, grain, and alfalfa (Pl. VII, fig. 2) are grown here than in the other oases of the Jerid. On the side toward the Shott new palm gardens are being established (Pl. VII, fig. 2) and are planted as far as possible to the Deglet Noor variety.

Tozer oasis lies about 15 miles east of Nefta. The oasis proper extends eastward and southward from the town of Tozer, which, like all the towns of the Jerid, occupies high, open ground outside the gardens. It is the political capital of the Jerid region. The elevation of the town above sea level is about 153 feet, but the oasis is several feet lower. The area of this oasis is variously given as 2,650, 5,400, and 7,400 acres, but it is probably larger than that of Nefta. Different authorities state the number of palms contained in this oasis at from 250,000 to 417,000, of which only about 14,000 are of the Deglet Noor variety. The gardens of Tozer differ from those of Nefta in the smaller development of subsidiary cultures. The chief fruit trees, other than date palms, are figs and pomegranates.

The oasis of El Oudiane begins about 5 miles east of the town of Tozer and extends for about 5 miles along the northern border of Shott Jerid, in a band that is from one-half mile to 2 miles wide. It lies so near the Shott that in winter the salt water sometimes rises nearly to the gardens. It is generally described as a group of five oases, but these are practically continuous, although each has its own village. The westernmost, known as El Degache, contains the finest gardens. The terrace, at the base of which the oases lie, is here much higher and closer to the gardens than at Tozer and Nefta, and El Oudiane is the best protected from the north wind of all the Jerid oases. Hence its dates, especially those of the Deglet Noor variety, are admitted on all sides to be the finest produced in the region.

There are estimated to be from 120,000 to 212,000 date palms in the El Oudiane oases. As 8,000 of these are said to be Deglet Noors, the percentage of that variety is considerably higher than in the other oases. Besides the magnificent date palms, there are about

[a] The "basket" of Nefta reminds one of the sunken gardens of the Oued Souf (Bul. 86, Bureau of Plant Industry), but is much larger than any of them

25,000 olive trees in the El Oudiane group, most of these being at Degache, where much oil is made for local use. There is also an abundance of other fruit trees, oranges, figs, pomegranates, apricots, grapevines, and even a few bananas. In fact, the gardens of El Oudiane are among the best kept and the most attractive in the Sahara. The population is more active and laborious than that of the other oases of the Jerid.

El Hamma, situated about 5½ miles north of Tozer, lies on the northwest point of the Draa-el-Jerid terrace, on the south declivity of which the other oases are placed. The oasis slopes westward to the Shott Gharsa, instead of toward Shott Jerid. It is practically unsheltered from the north wind, which is probably the chief reason why its dates are the poorest of the region. It contains only 60,000 or 70,000 palms, of which but 800 are Deglet Noors. With a few exceptions, the gardens of this oasis are neglected and have grown up in weeds and grass. Many of the palms receive no attention whatever, and many seedlings of inferior quality have been allowed to spring up. The population is sparse and seems to be thoroughly disheartened. Dates are said to mature less perfectly here than in the other oases.

THE NEFZAOUA.

The region known as the Nefzaoua occupies a narrow peninsula that is bounded on the south by the eastern end of the Shott Jerid and on the north by the Shott-el-Fejej. The latter, which is merely a prolongation of the former, extends eastward to within 14 miles of the coast, near Gabes. From Fetnassa, the northwesternmost oasis of the Nefzaoua group, to Kriz (El Oudiane), the nearest point in the Jerid, the distance is about 30 miles, the road leading diagonally across the salt-crusted mud flats of the Shott Jerid. From Kebili, the capital of the Nefzaoua (see map, fig. 1), to Gabes, on the coast, the distance is about 64 miles as the crow flies, the direction being a little north of east. By the road usually traveled, which follows the south shore of the Shott-el-Fejej, the distance is somewhat greater. Before the railway from Sfax to the phosphate mines west of Gafsa was built this road formed the principal outlet to the coast for the Jerid as well as the Nefzaoua oases. Along this route there are a few small oases, but no important ones are encountered until one nears Gabes.

The Nefzaoua comprises a large number of oases—more than 1,000, according to the estimates of reliable authorities. Most of these, however, are mere small groves of palms, only forty of them attaining any considerable size. They are situated both on the north and the south slope of the stony ridge that forms the backbone of the

peninsula. This ridge is the western extension of the desert mountain range known as the Jebel Tebaga, which forms the southern border of the Shott-el-Fejej. The oases that are on the south side of this ridge are naturally more sheltered from the north wind and better situated for the ripening of dates than those on the north side.

The population of the Nefzaoua is stated to be 25,000, distributed in 45 villages. The total number of date palms in the region is estimated by one authority to be 280,000, by another over 1,000,000. The first estimate is probably more nearly correct. It is a peculiarity of the Nefzaoua, which places it in strong contrast with the Jerid, that the oases are mostly situated upon the higher lands. The reason is that nearly all the springs are found craterwise at the summits of small volcano-like hillocks, and the gardens of date palms have grown up around them. The water supply is abundant, and owing to the situation of the springs with relation to the gardens irrigation is generally easy. In the oasis of Menchia, however, the gardens are generally some distance away from the springs, and water is conducted to them by means of tunnels that have been bored into the sides of the hills in which the springs rise. Some of these tunnels are said to have been constructed in the times of ancient Rome, this region also having been occupied by the Romans. In the Nefzaoua, as in the Jerid, the water sheet is located in cretaceous strata.

Menchia is the most important of the oases on the north side of the ridge. Its soil is sandy and contains much gypsum, but not an excessive amount of the more readily soluble salts. On the south slope the oasis which pertains to the two villages of Tlemine and Mansourah is the largest, and its gardens are the best kept of the region. It is said to contain 29,000 palms, while the next largest oasis, Kebili, contains 20,000. In these two oases the soils are generally excellent, although frequently a trifle salty.

The culture of the date palm is generally given less care in the Nefzaoua than in the Jerid. Many of the gardens have been allowed to grow up in seedlings of poor quality and are almost choked with weeds. The Deglet Noor variety has not heretofore been grown in the Nefzaoua, although the conditions would appear to be perfectly suitable for it. Recently the forestry service has taken some steps toward establishing its culture in some of the oases. The growing of other fruit trees and of crops of vegetables, cereals, and forage plants among the palms receives much less attention than in the Jerid. A great deal of trouble has resulted from the incursion of wind-blown sand, and here, as in the Jerid, the forestry service has had to undertake the protection of the oases by constructing palisades and by prohibiting the pasturing of animals on the outskirts of the gardens.

South of Kebili there is a region of sand dunes, and here the palms, according to M. Minangoin, inspector of agriculture, are grown in sunken gardens, similar to those of the Oued Souf region,[a] but on a smaller scale. In the oasis of Douz, about 16 miles south of Kebili, this form of date culture reaches its highest development in Tunis. There basins among the dunes are excavated to a depth of about 13 feet and often 100 to 130 feet square (the sand being carried out in baskets) in order to plant a dozen or so palms and a few other fruit trees. The palms grown with such an enormous expenditure of labor almost always belong to inferior varieties. During several months of each year most of the population of this oasis migrates in search of pasturage for its flocks. Upon the return of the inhabitants they must immediately set to work to clear out the sand that has invaded their gardens, a task that requires nearly as much labor as the original excavation.

GABES.

In extreme southern Tunis the Sahara Desert practically reaches the seashore, forming the region known as the "Aarad." One of the largest and most flourishing groups of oases in the country is that which has for its center the seaport town of Gabes. These oases are well supplied with water, those nearest Gabes chiefly by means of a series of little dams in the Oued Gabes (Gabes River) and its branches, the more distant ones from springs and wells. The large oasis of El Hamma—of the same name as one in the Jerid region—is famous for its hot springs. This oasis has an area of about 4,000 acres, and the combined area of those nearer Gabes is said to be about the same.

About 400,000 date palms are estimated to exist in the oases of Gabes and El Hamma together. At Gabes the humidity, due to the proximity of the sea, prevents the successful growing of the finer varieties, notably the Deglet Noor. While the date palm itself thrives admirably in the Gabes region, and a great number of varieties exist there, the fruit produced is far inferior in flavor and sweetness to that of the Jerid and the Nefzaoua. Moreover, it is said not to keep well and easily to become moldy. The same criticism applies to the dates grown on the neighboring island of Jerba, where also there are about 400,000 palms.[b] But at El Hamma, although only 15½ miles inland, the quality of the dates is appreciably better.

[a] See Bul. 86, Bureau of Plant Industry, U. S. Department of Agriculture, 1905.

[b] It is interesting to know that some kinds of dates can be ripened on the seacoast, even considerably farther north than Gabes. M. Minangoin, inspector of agriculture at Tunis, in a letter to the writer, describes a small oasis of 4,000 to 5,000 palms, situated on a sand spit near Susa (Sousse), about 120 miles north of Gabes. Two kinds of dates are grown, of one of which the fruits must be eaten the day they are gathered, while the other kind can be kept for only

In respect to other cultures, however, Gabes is easily first among the Tunis oases. Garden vegetables grow to perfection beneath the palms and mature so early that were there better facilities for transportation there would be a large profit in shipping them to European markets. Alfalfa grows beautifully and gives a rapid succession of cuttings throughout most of the year. Large yields of barley are obtained. Fruit trees of various kinds, but especially figs and pomegranates, are abundant and produce fruit that is highly esteemed throughout Tunis. Gabes is celebrated for the production of a small, deliciously flavored banana that is exported in some quantity to Europe. The grapevine grows to enormous size, and individual vines that produce 330 pounds of fruit are said to be not uncommon. Notwithstanding the scanty rainfall, plantations of oil olives in land that is not irrigated, similar to those of Sfax, are being established on the outskirts of some of the oases.

GAFSA.

The town of Gafsa is situated about 50 miles northeast of Tozer, the capital of the Jerid, and is connected with Sfax, on the east coast of Tunis, by a railway about 125 miles long. The elevation of Gafsa above sea level is about 1,150 feet. Tributary to the oasis of Gafsa itself are one or two other oases of small importance. Gafsa oasis contains from 50,000 to 65,000 date palms. These belong mostly to inferior varieties, and the dates produced are of mediocre quality. Because of its much greater elevation this locality is entirely unsuited to choice varieties, such as the Deglet Noor. The water supply is more than ample for the present extent of the oasis. The date is here hardly a more important crop than the olive, of which there are many thousands of trees. Oil varieties predominate. At the beginning of the Christian era Gafsa (then known as Capsa) was included in the great olive zone that extended from the east coast of Tunis across into Algeria, and of which only scattered fragments remain.

four or five days. These must be picked from the bunches as fast as they ripen, which necessitates climbing each palm every day until all of its product is harvested. These dates are sold in the markets of Susa at a rather high price, as they ripen at a time when other fresh fruit is not obtainable. They are eaten only by the natives, Europeans holding them in small esteem. The high value set upon them by the natives is shown by the fact that the offshoots are sold at a price of $2 apiece. While the two varieties grown at this locality are doubtless of little intrinsic value, it is remarkable that dates of any sort will mature under these climatic conditions; for at Sfax, where the summers are slightly hotter than at Susa, the normal sum total of mean daily temperatures from May 1 to October 31 is only 1,968° F., and the normal sum of mean daily maxima during the same period is only 3,375° F.

At the present time the culture of the olive as carried on at Gafsa leaves much to be desired, and the gardens are generally not well cared for. The pomegranates of Gafsa are considered the best grown in Tunis.

CLIMATE.

The climate of southern Tunis is essentially that of a desert, although modified by the nearness of the sea. This modification is, of course, most marked at Gabes, on the coast, which has a more humid atmosphere and lower summer temperatures than the other oasis groups, and is consequently not well adapted to the culture of the finest varieties of dates. At Gafsa the air is drier than at Gabes, but the high altitude (1,000 feet) lowers the temperatures and shortens the summer to a degree that renders this oasis unsuitable for the late-ripening varieties. Only in the Jerid and the Nefzaoua oases do we find the climatic conditions that are necessary for the perfect ripening of the finest sorts of dates.

TEMPERATURE.

In the following tables data are given for five localities in Tunis where the date palm is the principal culture, viz, Tozer and Nefta (Jerid), Kebili (Nefzaoua), Gabes, and Gafsa. The normals for the different localities and for different months have been compiled from records of observations covering periods of unequal length, being from nine to thirteen years at Tozer. The monthly normals for Gabes and Gafsa have been corrected so as to agree with the normals of fifteen years for each season (winter, spring, summer, and autumn).[a] All temperatures are given in degrees Fahrenheit.

[a] As given by G. Ginestous (Etude sur le Climat de la Tunisie, Bul. Dir. Agr. et Com., Tunis, 1902, pp. 64, 210, 334, 413; 1903, p. 103). The discrepancy between the seasonal normals given by this author and the monthly normals compiled from various sources is usually only a fraction of 1 degree Fahrenheit for each month, although sometimes amounting to 3 or 4 degrees. The monthly normals have been compiled from the records published in the Annales du Bureau Central Météorologique de France and in the quarterly Bulletin de la Direction de l'Agriculture et du Commerce de Tunis. Those for Nefta and Kebili, localities for which seasonal normals are not given by Ginestous, are based upon short periods of observation, in no case exceeding six years, and in some cases of only three years, although generally four or five years.

TABLE 1.—*Normal mean temperatures of localities in the desert regions of Tunis, Algeria, and the United States.*

Month.	Tunis.					Algeria.			United States.		
	Tozer.	Nefta.	Kebili.	Gabes.	Gafsa.	Biskra.	Tougourt.	Ouargla.	Phoenix, Ariz.	Yuma, Ariz.	Volcano Springs, Cal.
January	51.3	50.5	49.6	51.8	49.2	50.5	47.3	46.8	49.8	54.1	55.9
February	55.9	56.3	56.5	55.6	53.7	53.2	49.8	51.8	54.3	58.6	60.5
March	62.1	61.1	61.7	59.7	58.1	58.3	54.9	59.9	53.9	63.9	68.4
April	68.7	69.2	71.9	64.2	64.2	63.1	64.0	66.4	67.0	69.9	79.7
May	76.1	74.5	74.8	69.2	71.4	71.8	74.8	73.6	74.4	76.9	87.5
June	86.2	84.3	84.1	76.3	80.4	80.6	86.0	82.4	83.9	84.4	96.6
July	92.0	89.1	89.4	81.3	85.6	87.1	92.1	90.7	90.2	91.2	101.3
August	92.0	88.8	87.0	81.0	85.4	85.8	85.1	86.0	88.2	90.4	99.7
September	83.1	83.8	82.5	80.0	81.7	78.8	83.7	78.1	81.4	84.3	89.5
October	73.0	72.9	72.5	72.8	71.3	67.6	68.4	63.5	69.3	72.4	78.4
November	61.7	61.4	59.8	62.9	59.8	57.2	58.5	52.9	58.5	62.3	67.0
December	52.3	53.0	52.0	54.3	48.6	51.3	48.9	45.0	52.3	55.9	57.4
Year	71.2	70.4	70.1	67.4	67.4	67.1	67.8	66.4	68.6	72.0	78.5

Comparing the Tunis localities among themselves, we notice that during most of the year the Jerid oases (Tozer and Nefta) are the warmest, and that next to them is the Nefzaoua (Kebili). In November, December, and January, however, the highest means are reached at Gabes, on the seacoast. The normal yearly means are higher in the Jerid and the Nefzaoua than in any of the Algerian oases. The difference is particularly noticeable during the winter months, when the means are decidedly lower in the Algerian oases than in those of the Jerid and the Nefzaoua. The normal means of most months are higher in the Jerid and Nefzaoua oases than at Phoenix, Ariz., but lower than at Yuma, Ariz. They are much lower in every month than at Volcano Springs, Cal.

TABLE 2.—*Normal mean maximum and minimum temperatures of localities in the desert region of Tunis.*

Month.	Mean maxima.					Mean minima.				
	Tozer.	Nefta.	Kebili.	Gabes.	Gafsa.	Tozer.	Nefta.	Kebili.	Gabes.	Gafsa.
January	59.4	63.7	57.9	62.7	59.5	42.8	37.7	39.2	40.7	39.5
February	65.5	70.0	65.8	67.6	66.2	46.5	41.3	41.9	43.6	39.3
March	72.5	76.1	72.5	71.3	70.4	52.3	47.3	48.2	48.6	44.6
April	81.3	86.5	84.4	76.0	80.7	56.8	54.1	56.8	53.5	49.9
May	89.1	89.0	88.3	78.9	85.2	65.3	60.2	60.2	58.0	56.3
June	99.7	99.2	96.9	85.3	96.5	74.1	69.2	68.2	67.2	63.9
July	107.1	104.9	103.8	90.8	102.8	77.6	73.2	73.4	71.0	69.7
August	104.6	103.8	101.3	91.4	101.2	79.5	74.4	72.2	71.3	69.1
September	93.7	98.3	95.1	91.9	96.2	72.5	69.5	69.8	71.0	66.0
October	83.2	86.1	82.6	83.6	84.0	63.1	58.1	60.6	61.5	57.3
November	70.5	76.1	70.6	73.3	75.0	53.2	50.5	48.2	50.5	47.2
December	60.3	71.0	61.1	65.6	60.2	44.7	40.1	42.4	44.2	37.7
Year	82.2	85.4	81.7	78.2	81.5	60.7	56.3	56.8	56.8	53.4

As is shown by the foregoing table, the normal yearly maxima are highest in the Jerid oases (Tozer and Nefta) and are lowest at Gabes, on the coast. In winter the maxima are higher at Nefta,[a] but lower at Tozer than at Gabes. At Tozer the minima are higher for nearly every month than at any other locality in Tunis, while at Nefta those for June, July, and August are higher than at any other locality excepting Tozer. Comparing Gafsa, which has an elevation above sea level of 1,000 feet, with Gabes, on the coast, we find the maxima higher at the former point in all seasons except winter. The minima are lower at Gafsa than at Gabes in every month of the year.

A climatic factor upon which the success of date culture largely depends is the sum total of heat received during the ripening period, which can be taken as comprising the six months from May 1 to October 31. As it is still a question whether the sum total of the daily means or those of the daily maxima give the best expression of this factor, both sums have been computed for the Tunis localities, and are given in the following table. Following the suggestion made by Mr. W. T. Swingle,[b] the sums of the daily means are based upon the excess of the normal monthly means over 64.4° F.; while in computing the sums of the daily maxima above 64.4° deduction has been made for normal monthly minima that fall below that temperature.

[a] As pointed out on p. 21, however, the results for Nefta and for Kebili are based upon too short periods of observations.

[b] Bul. 53, Bureau of Plant Industry, pp. 65–68.

TABLE 3.—*Sums of daily mean and daily maximum temperatures above 64.4° F. from May 1 to October 31, at localities in the desert regions of Tunis, Algeria, and the United States.*[a]

Locality.	Sum of daily mean temperatures.	Sum of daily maximum temperatures.	Period covered by observations.	Remarks.
Tozer, Tunis	3,555.5	5,818.5	9 to 13 years	All varieties, including Deglet Noor, ripen perfectly.
Nefta, Tunis	3,277.7	5,710.4	3 to 6 years	Do.
Kebili, Tunis	3,183.1	5,357.6	4 to 5 years	Several first-class varieties ripen perfectly. Deglet Noor not yet grown.
Gabes, Tunis	2,272.7	3,936.5	15 years	Finest varieties do not ripen well; even second and third class dates do not always ripen perfectly.
Gafsa, Tunis	2,738.1	4,943.9	do	Too cold to mature the finest varieties.
Biskra, Algeria	3,304.0	5,489.0	10 years (means), 12¼ years (maxima).	Many varieties ripen perfectly, but the Deglet Noor is generally unsatisfactory.
Ayata, Algeria	3,488.0	5,932.0	3 years (means), 4 years (maxima).	Deglet Noor ripens well in hot summers, imperfectly in cool summers.
Phoenix, Ariz	3,019.0	5,523.0	Many years (means), 4 years (maxima).	Many varieties ripen well, but not the Deglet Noor.
Salton, Cal	4,823.0	7,306.0	12 years (means), 2 average years (maxima).	Dates not grown.

It would appear that for purposes of comparison of different localities as to their suitability for the culture of fine varieties of dates the sums of the daily maximum temperatures are more satisfactory than those of the daily means. For at Biskra, Algeria, where the Deglet Noor seldom ripens properly, the normal sum of the daily means is higher than that given above for Nefta, and only 250 degrees lower than at Tozer, yet at both of these Tunis localities the Deglet Noor rarely fails to mature, while the normal sums of the daily maxima both at Tozer and at Nefta are considerably higher than at Biskra. Furthermore, at Ayata, Algeria, in 1891, when Deglet Noor dates ripened "very slowly and imperfectly," the sum of the daily means was 3,431, or only 124 degrees lower than the normal for Tozer as given in the table. But in favor of the sum of the means rather than of the maxima is the fact that at Ayata, where the Deglet Noor does not ripen well every season, the normal sum of the maxima is nearly 100 degrees higher, while that of the means is about 70 degrees lower than at Tozer. At Phoenix, Ariz., where the Deglet Noor will probably not mature, the sums of daily mean and daily maximum temperatures are several hundred degrees lower than at Tozer. At Salton, Cal., however, both

[a] The sums for Biskra and Ayata, Algeria, and for Phoenix and Salton, in the United States, are those given by Swingle, Bul. 53, Bureau of Plant Industry, pp. 66 and 68. As explained by Mr. Swingle, the method of observing temperatures formerly used at Salton has probably made the sum for that point appear to be higher than is actually the case.

sums are so very much higher than at Tozer that, even when we make a considerable allowance for the probable overestimate, due to the way the observations have been taken at Salton (see p. 24), we can not doubt that the Salton Basin is hot enough for the perfect ripening of all the Tunis varieties of dates. At Gabes, on the coast of Tunis, only second or third rate varieties are grown, and even these often fail to mature well, as would be expected from the low sums of temperature (much lower than at Tucson, Ariz.). At Gafsa, also, where the sums of the daily mean and daily maximum temperatures are, respectively, nearly 300 and nearly 500 degrees lower than at Phoenix, none of the first-class varieties can be successfully grown.

A comparison of the weather of several successive years at Tozer during the six months that are most decisive in the ripening of dates, with statements of the character of the succeeding crops, is presented in the following table:

TABLE 4.—*Climatic conditions and character of date crop at Tozer, 1901 to 1905.*

Year.	Sum of means, May to October.	Sum of maxima, May to October.	Rainfall, May to October.	Character of crop.
1901	3,459	5,335	May 0.87 June July August September 1.07 October .84 2.78	Yield not stated. Quality lowered by September rains, especially inferior sorts, which contained many worms.
1902	3,899	5,922	May June July August September 0.64 October 1.78 2.42	Crop very large, but quality somewhat injured by autumn rains.
1903	3,309	5,793	May June July August September 0.93 October .93	Crop much smaller than in 1904.
1904	3,719	5,622	May June July August 0.08 September .13 October .13 .34	Crop very large and of excellent quality.
1905	3,565	5,643	May 0.17 June .75 July .11 August September October .40 1.43	Harvest retarded until October 23-26. Dates ripened imperfectly.

Judging by the data for 1904, the period of the writer's visit, when the crop was admitted on all sides to be an unusually fine one, both as to the quality and quantity of the fruit, it would seem

as if the sum of the daily means, which in 1904 was more than 150 degrees higher than the normal, were a more satisfactory basis for comparing one season with another at the same locality than the sum of the daily maxima, which was about 200 degrees lower than the normal. Furthermore, in 1905, when the ripening of the dates was late and imperfect, the sum of the daily means was nearly normal, while that of the daily maxima was again nearly 200 degrees lower than the normal. In 1903, when the crop was much smaller than in 1904, the sum of the daily maxima was only 25 degrees lower than the normal, while the sum of the daily means was nearly 250 degrees below the normal. Still more conclusive are the data for 1902, a year when the crop was unusually large. The sum of the daily maxima of that season was only 100 degrees higher, while that of the daily means was 350 degrees higher than the normal.

TABLE 5.—*Mean maximum and minimum temperatures at Tozer during the months of May to October, 1904 and 1905.*

Year.	May.		June.		July.		August.		September.		October.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1904	90.3	65.3	89.2	75.7	104.7	85.4	108.7	84.4	96.2	73.7	83.1	61.3
1905	89.4	63.5	98.2	72.7	105.0	80.0	104.3	79.7	97.3	75.9	78.6	62.8

Comparing further the good year 1904 with the poor year 1905 at Tozer, we find that while the mean maximum was much higher in June and slightly higher in July in the latter year, the August and October maxima were considerably higher in 1904, while those for May and September differed little in the two years. The mean minima during the first four months of the season were considerably higher in 1904 than in 1905.

ATMOSPHERIC HUMIDITY.

The amount of moisture in the air is an important factor in date culture. At Gabes, in Tunis, one of the few localities in the world where the date palm is extensively grown on the seacoast, the quality of the fruit is often seriously impaired by this cause (see p. 19). In the following table the mean relative humidity for each of the four seasons and for the year is given for several localities in North Africa, where date culture exists, and for localities in the southwestern United States, where it can probably be successfully introduced.

TABLE 6.—*Mean relative humidity at localities in the desert regions of Tunis, Algeria, and the United States.*

Season.[a]	Tunis.			Algeria.		United States.
	Tozer.	Gabes.	Gafsa.	Biskra.	Ouargla.	Yuma.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Winter	70.6	70.1	64.0	59.8	48.5	46.9
Spring	63.0	65.0	57.6	47.7	46.4	38.3
Summer	52.0	64.1	47.0	34.9	30.1	41.7
Autumn	59.6	67.6	59.6	51.3	47.6	44.7
Year	61.3	66.7	57.0	48.4	43.1	42.9

[a] Winter comprises December, January, and February; spring, March, April, and May; summer, June, July, and August; and autumn, September, October, and November.

As shown by the above table, the Tunis oases have at all seasons a decidedly more humid atmosphere than those of Algeria. At Yuma the air is drier than at any of the North African localities, except in summer, when Yuma is more humid than Biskra and Ouargla. Comparing the three Tunis localities one with another, we find that at most seasons the humidity is greatest at Gabes, as would be expected from its situation on the coast, and least at Gafsa, which lies in the midst of extremely arid elevated plains and is cut off from the sea by ranges of desert mountains. Tozer in winter is slightly more and in spring little less humid than Gabes, but in summer and autumn it is decidedly drier. All things considered, the humidity at Tozer is surprisingly higher for a locality where the finest kinds of dates are produced.

PRECIPITATION.[a]

TABLE 7.—*Normal precipitation, in inches, at localities in the desert regions of Tunis, Algeria, and the United States.*

Season.	Tunis.				Algeria.			United States.		
	Tozer.	Nefta.	Gabes.	Gafsa.	Biskra.	Tougourt.	Ouargla.	Phoenix, Ariz.	Yuma, Ariz.	Volcano Springs, Cal.
Winter	1.7	1.4	2.8	2.4	2.1	2.0	1.4	2.3	1.3	1.1
Spring	2.4	2.1	1.9	3.4	2.2	1.6	1.4	1.0	0.4	0.1
Summer	0.1	0.2	0.1	0.6	0.6	0.1	0.1	2.0	0.5	0.2
Autumn	0.7	0.7	2.7	1.9	1.8	1.3	0.7	1.5	0.6	0.2
Year	4.9	4.4	7.5	8.3	6.7	5.0	3.6	6.9	2.8	1.6

The total annual rainfall of the Jerid oases (Tozer and Nefta) is very much less than that of Gabes, on the coast of Tunis, and of Gafsa, which has an elevation of 1,000 feet above sea level. Tozer

[a] The relation of the rainfall of the Tunis oases to date production is discussed under the heading "Ripening," on pp. 51 and 52 of this bulletin.

has about the same total precipitation as Tougourt, in Algeria, considerably more than Ouargla, Algeria, and considerably less than Biskra, Algeria, and Phoenix, Ariz., the last two localities having nearly the same total. The Colorado River Valley and the Salton Basin in the United States receive considerably less rain than any of these North African localities. Regarding the distribution by seasons, we find that nearly one-half of the total precipitation falls in spring in the Jerid oases, a larger proportion than at any of the other localities given in the table. The autumnal precipitation is relatively smaller at Tozer and at Nefta than at any of the other localities excepting Volcano Springs, Cal. At Phoenix and Yuma, Ariz., the rainfall in summer forms a much higher proportion of the total for the year than at any of the other points included in the table.

IRRIGATION AND DRAINAGE.

As the water supply and irrigation conditions of the oases of the Nefzaoua, Gabes, and Gafsa have been briefly discussed under the heading "Geography," only the Jerid region will be treated in this place.

WATER SUPPLY.

The oases of the Jerid, unlike those of the Oued Rirh, in Algeria,[a] are watered by means of springs instead of wells. This is explained by the fact that the Jerid oases are situated at the very base of the terrace that marks the northern frontier of the desert, while the Oued Rirh group lies well into the Sahara. Attempts to obtain artesian water in the Jerid region have so far been unsuccessful.

The springs of the Jerid are all situated at about the same elevation—135 to 150 feet above sea level. They originate in strata of cretaceous formation at the base of the line of bluffs. As the springs are very numerous and in many cases very large, maintaining a practically constant flow throughout the year, it seems unlikely that the scanty rainfall of the region itself can account for the abundance of the water supply.[b] The general temperature of the water as it issues from the ground is about 86° F., and varies little from season to season.

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[a] See Bul. 53, Bureau of Plant Industry, U. S. Dept. of Agriculture, pp. 44–46, where the irrigation of the date palm in the Algerian Sahara is described; also, Bul. 80, Bureau of Plant Industry, pp. 36–38, where this subject is discussed.

[b] Rolland, Hydrologie du Sahara Algérien, pp. 182, 183, holds that the water which feeds the springs of the Jerid must constitute an artesian sheet, derived largely from the eastern spurs of the Aurès Mountains and flowing deep under the elevated plain which abuts on the shotts of southern Tunis. On the other hand, Doumet-Adanson (Sur le régime des eaux qui alimentent les oasis du Sud

The oasis of Nefta is supplied with water by a large number of springs that arise in the "Corbeille," or "basket" (p. 15). Their combined flow, amounting to about 292 gallons (1,100 liters) per second, gives rise to the stream which waters the southern part of the oasis. This quantity of water is estimated by Rolland to be sufficient for irrigating the entire oasis at the rate of about 2 acre-feet per acre annually.

Taking as the number of date palms existing at Nefta the mean of the two estimates given on page 15, we should have 282,500 trees. If the total supply furnished by the springs were divided equally among them, each would receive about 0.24 quart per minute,[a] or about 86 gallons per day. As it has been calculated by Rolland that to give the best results each date palm should be allotted at the source of supply 0.53 quart (0.5 liter) per minute (hence about 190 gallons per day)[b] it is evident that the supply available is not sufficient for the perfect irrigation of more than one-half of the date palms of the oasis.

The 140 springs that supply the oasis of Tozer with irrigating water give rise to a stream that delivers about 278 gallons (1,050 liters) per second; hence about 3,200,000 cubic feet daily. This quantity is estimated to suffice for irrigating the oasis at the rate of about 1.5 acre-feet per acre annually. Assuming that there are 385,500 palms (the mean of the two estimates given on page 16) in this oasis, and making the calculation upon the same basis as for Nefta, the share of water at the source of supply available for each tree would be only 0.17 quart per minute, or 62.4 gallons per day, which is less than one-third the amount (0.53 quart per minute) estimated by Rolland as the optimum.[c] It should be noted, however, that the distribution of water among the different parts of the oasis is very

de la Tunisie, Assoc. Franç. Avancem. Sciences, 1884, p. 72) regards the infiltration water drained through the sands of the adjacent region as sufficient to supply these springs. He does not consider the water sheet to be of artesian character.

[a] Rolland, assuming that there were 201,100 palms at Nefta, calculated that there should be available for each, at the source of supply, 0.33 liter (0.35 quart) per minute. In his, as in the writer's calculation, no deduction is made for the amount of water lost to the palms through seepage and evaporation from the ditches, growing of other crops, and use by the inhabitants and their domestic animals.

[b] See Bul. 53, Bureau of Plant Industry, p. 45.

[c] A much lower estimate has been made by M. Minangoin, inspector of agriculture at Tunis, of the amount of water theoretically available for each date palm in the oasis of Tozer. He states that the combined flow of the 140 springs is only 1,700,000 (instead of 3,200,000) cubic feet daily; and assuming that there are 300,000 trees in the oasis, he arrives at the figure of 42 gallons (160 liters) as representing the amount available at the source of supply for each palm daily.

unequal, the palms in some gardens being amply and even superabundantly irrigated, while thousands of trees receive no irrigation whatever, except by seepage.[a]

There is some indication that the flow of the springs at Tozer is diminishing in volume. It would appear also that there has been a gradual lowering of their level, due to the progressive cutting down of the beds of the streams derived from them, and that in consequence the irrigable area of the oasis is diminishing.[b]

In the oasis, or oasis group, of El Oudiane 60 springs furnish the water with which the gardens are irrigated. They are generally smaller than those of Nefta and Tozer, and their flow is said to be perceptibly diminishing. Their waters are not united to form a large stream which is subsequently divided and subdivided by dams, as in the oases just described, but are for the most part conducted directly to the gardens. These, owing to the small width of the oasis and its situation at the very foot of the terrace, are nowhere far removed from the sources of supply.

At El Hamma there are 15 springs of considerable size, one of them having a temperature of 107.5° F. (42° C.). To this spring, which is much frequented by the natives for the sake of the hot baths it affords, the oasis owes its name, which means "the bath."

A sample of irrigating water was collected by the writer in the main stream of Tozer, above the first dam which divides it. This water, tested both at the moment of collection and two months later, when the analysis was made, gave neither an alkaline nor an acid reaction. Its electrical resistance at the time when the sample was taken was 117.3 ohms at 60° F. The chemical analysis, made in the laboratory of the Bureau of Soils, showed 209.2 parts of soluble matter per 100,000 of water. The composition of the soluble contents was as follows, in percentages of the total:

TABLE 8.—*Chemical composition of irrigation water, Tozer oasis.*

Components (ions).		Conventional combinations.	
Calcium	8.50	Calcium sulphate	28.87
Magnesium	4.54	Magnesium sulphate	17.36
Sodium	9.13	Potassium chlorid	23.47
Potassium	12.34	Magnesium chlorid	4.11
Sulphions	34.23	Sodium chlorid	16.68
Chlorions	24.33	Sodium bicarbonate	9.51
Carbonic acid	6.33		100.00
	100.00		

[a] At Biskra, in Algeria, 0.12 quart per palm per minute is found to give satisfactory results, the water being retained at the bases of the trees in holes that are dug for the purpose. (See Bul. 53, Bureau of Plant Industry, p. 47.)

[b] Doumet-Adanson (ibid.) noticed old date palms at Tozer that could no longer be irrigated, being no less than 40 feet above the present level of the springs.

It is evident from this analysis that the water afforded by the springs of Tozer is pure enough to be used with perfect safety in irrigating any crop grown there. As the springs of the other oases of the Jerid have a similar origin to those of Tozer, it is probable that the composition of their waters differs little from the foregoing.

IRRIGATION SYSTEM.

Irrigation at Tozer has been brought to a higher stage of development than elsewhere in the Jerid, and a description of the system in use at Tozer will serve for the other oases as well.[a] It is said to have been elaborated long ago by an Arab named Ben Chabet, and to have been religiously maintained, unchanged as he planned it, to this day.

FIG. 2.—Irrigation canal and diversion dam, Tozer oasis.

The details of its management are transmitted from father to son in a certain family. Having perfected the system at Tozer, Ben Chabet offered to do the same service for the inhabitants of Nefta, who were constantly in dispute over their water rights, but their jealousy of Tozer prevented their accepting his offer. French students of the Tozer system praise very highly the ingenuity and thoroughness with which it has been worked out.

The main stream which collects the waters of all the springs of Tozer is divided and subdivided by a series of dams made of palm logs (fig. 2) until the water reaches the ultimate divisions or seguias (ditches) which supply each individual garden. The log which

[a] For a detailed account of this system, see F. Masselot, "Les Dattiers des Oasis du Djérid," Bul. Dir. Agr. et Com. Tunis, 1901, pp. 137–142.

is laid across the canal to form the dam is divided into a series of long, shallow notches, separated by narrow ridges. The number of notches in each dam corresponds to the number of parts into which the stream is to be divided at that point. Thus, if three-fifths of the water is to be diverted into one of two branches and two-fifths into the other, five notches are cut, the water passing over three of them going to the first branch and the rest to the second. The notches being all of the same length and depth, the division is quite accurate. Divisions of the main stream down to the twenty-first part of the total flow are not transferable, belonging for all time to the same district of the oasis. Smaller fractions of the water, however, can be alienated, and there is much bartering of water rights among the different proprietors of gardens.

At all the principal diversion dams, guards are stationed day and night to prevent any tampering with the water, there being three guards at the first diversion and two at each of the other important ones. These guards are paid with a bunch of Fteemy dates from each garden that receives water passing over the dam they tend, those at the first diversion being entitled to a bunch from every garden in the oasis. The "amin,"[a] or expert, who supervises the entire system has also the right to select a bunch of Fteemy dates from every garden, his being the first choice after the "khammes," or tenant, of the garden.

The principal canals are kept up by assessment upon all the owners of gardens supplied by them. Smaller ditches (seguias) must be kept in order by the tenants of the gardens served by them, and it is also the duty of the khammes (tenant) to be on hand at the small dam which diverts water into his ditch when it is the turn of his garden to receive water, for there is a fixed hour for the irrigation of each garden.

The method of measuring time in connection with this irrigation system is an interesting one. A metal cup-like receptacle, called a "gadous," is filled with water and hung up in a convenient place by the dam. The bottom of the receptacle is perforated, and the hole is always of the exact size necessary to let all the water run out in just five minutes. The water that runs over a notch in the dam during the time required for the gadous to empty eleven times (hence, in fifty-five minutes) is sufficient to irrigate thoroughly a garden of 2.4 acres (1 hectare), the length of the notch being fixed and its depth corresponding to the velocity of the current.

[a] The "amins" (pronounced "ameens") are selected from among the older inhabitants of the community for their knowledge of agricultural matters. Their function is to act as arbiters in disputes concerning water rights, the relations between proprietors and tenants, the sale of agricultural products, etc.

The gardens are divided into small plots by means of banks of earth, to facilitate irrigation, as in the basin method used in the United States. The water from the ditch (seguia) is turned into the nearest plot through a breach made in its bank, the ditch being dammed at that point with a few spadefuls of earth. When the soil is sufficiently saturated, the farther bank is cut, allowing the water to pass on into the plot beyond; and so on, until the whole garden has been irrigated. In this way not only the date palms, but the other fruit trees and the small crops among them that occupy a portion of every garden, are irrigated simultaneously.

DRAINAGE SYSTEM.

Owing to the situation of the oases on the edge of the Shott Jerid and the great amount of water used in irrigation, its soils would be completely water-logged were it not for the excellent provision that has been made for drainage. Each garden is provided with open drainage ditches, or "khandaks," these being generally about 166 feet apart and about 5 feet deep. They are constructed at the expense of the proprietor of the garden, the work of keeping them open devolving upon his tenant. Several of these smaller drains unite to form a large ditch, which is kept up by an association of the proprietors whose gardens are served by it, each contributing in proportion to the size of his water right. Finally, at Tozer, all the drainage ditches empty into a main one called the "Khandak-el-Kebir," which runs along the southern side of the oasis and carries its drainage water to the Shott Jerid. In former times, when Tozer was frequently raided by the savage nomadic tribes of the desert, this large drainage ditch also served the inhabitants as a moat for the defense of the oasis. Not only is this excellent drainage system useful for ridding the oasis of surplus water, but it renders inestimable service in preventing the harmful accumulation of salts or "alkali." (See p. 36.)

SOILS OF THE JERID REGION.

TEXTURE.

As the soils of the Jerid region only were investigated, the discussion which follows relates only to that group of oases. All samples for analysis were collected at Tozer, but the composition of the soils of the other three oases is probably similar, except that those of Nefta apparently contain a higher percentage of sand. The date palm is said to grow most rapidly and vigorously in the soils that are richest in clay, although yielding a better quality of fruit in the sandier soils.

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The following table gives the results of mechanical analyses of the samples taken, as furnished by the Bureau of Soils. Descriptions of the localities where each sample was obtained will be found in Table 11, on page 37, under corresponding numbers.

TABLE 9.—*Mechanical analyses of soils of Tozer oasis.*

Number of sample.	Depth of sample.	Character of soil.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
	Inches.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
1	0 to 36	Fine sandy clay, water at 36 inches depth.	0.3	4.0	4.0	17.6	23.1	13.0	38.6
2	0 to 36	Heavy, fine sandy loam, changes to blue clay near bottom of boring, water at 24 inches depth.	.9	6.3	6.5	22.1	36.1	7.8	20.5
3	0 to 24	Fine sandy clay, water at 12 inches depth.	.3	4.7	4.6	25.2	26.2	8.6	30.6
4	0 to 36	Fine sandy clay, water at 36 inches depth.	.3	3.2	3.7	19.4	25.8	11.2	36.4
5	0 to 36	Light, fine sandy clay	.5	4.5	5.3	19.7	34.3	6.9	28.7
6	36 to 72	Subsoil of No. 5, sandy clay, water at 60 inches depth.	1.4	5.2	5.4	21.1	32.5	5.3	26.9

It will be seen from the above analyses that the typical soil of Tozer oasis is a mixture of fine sand and clay, chiefly remarkable for its small percentage of silt. Soils of this type occur also in the Oued Rirh oases of Algeria. According to Dr. L. J. Briggs, they are seldom found (as soils) in the United States, although subsoils of similar composition are sometimes met with in the Atlantic Coastal Plain. In the field these soils do not impress one as being particularly heavy, notwithstanding the large amounts of clay they contain. The discrepancy is probably to be explained by the fact that they contain great quantities of lime in the form of calcium carbonate and of gypsum, calcium sulphate. (See Tables 11 and 12.) These salts have a tendency to cement the fine particles of clay into masses that imitate grains of sand and make the soil appear of coarser texture than it is found to be when examined in the laboratory. In the process of mechanical analysis much of the lime is dissolved and the fine clay particles fall apart. Furthermore, most of the relatively insoluble lime is probably classified as "clay" in computing the results of the mechanical analysis. A similar discrepancy between field observations and laboratory analysis was noted by Mr. Thomas H. Means and accounted for in this way in the case of soils from the Oued Rirh oases in Algeria.[a]

[a] See Bul. 80, Bureau of Plant Industry, pp. 41, 42 (1905). Many of the samples described in the table on page 42 of that bulletin show a mechanical composition very similar to the samples from Tozer.

In well-cultivated gardens the upper few inches of the soil contain a considerable amount of humus and are quite black in color, as would be expected from the fact that not only date palms and other fruit trees, but garden vegetables, forage crops, and cereals have been grown in the oases, probably without intermission, for many hundreds of years.

FERTILITY.

As to the composition of the soils of this oasis, so far as the important elements of plant food are concerned, the following table of a chemical analysis by acid digestion will furnish an indication:

TABLE 10.—*Plant food constituents of soils of Tozer oasis.*

	Per cent.
Nitrogen (total)	0.03
Lime (CaO)	13.08
Potash (K_2O)	1.10
Phosphoric acid (P_2O_5)	.14

The sample (No. 2 of Tables 9 and 11) was taken to a depth of 36 inches in a well-cultivated garden of young Deglet Noor palms, amid a thin, newly planted stand of alfalfa, and contained only a moderate amount of readily soluble "alkali" salts, as will be seen by reference to column 4 of Table 11.

If it be permissible to generalize upon the scanty data given above, it can be said that the soils of Tozer are decidedly low in nitrogen. When we consider that these soils are continually and lavishly irrigated with water that contains very little organic matter, that manure is scarce, and that leguminous crops occupy at no time more than a small fraction of the total area of the oasis, the poverty of the soil in nitrogen is not remarkable. If the analysis had been based only upon the surface 6 inches, a much better showing in this respect would doubtless have been made. Lime is present in much larger quantity than is usually considered necessary in the average cultivated soil. Potash, likewise, is present in far more than the usual proportions. Finally, the phosphoric-acid content is such as would generally be considered satisfactory.

According to the conventional standards the soils of Tozer would therefore be in all respects first-class, so far as plant-food constituents are concerned, were it not for their low nitrogen content. It would seem that to remedy this deficiency the growing of berseem (Egyptian clover) should be undertaken, as this crop ought to thrive in the Jerid region, with its mild winter climate and abundance of irrigating water.

ALKALI.

Where the gardens are well cared for and receive frequent irrigations, the soils contain very little readily soluble salts, and no trace of saline efflorescence is to be seen. But in neglected parts of the oasis, and especially in the low-lying lands situated near the Shott Jerid, the ground is often covered with a glistening white crust of salt, often to a depth of half an inch or more. Throughout the oasis one sees pieces of land that have been left for several years without irrigation, although surrounded on all sides by well-cared-for gardens. While the soil of the gardens only a few rods distant does not contain a large amount of readily soluble salts, the surface of the abandoned tract is usually covered with a white efflorescence, and bears a scattered vegetation of fleshy-stemmed "pickle weeds" or other salt-loving plants and an occasional small, stunted date palm. (Pl. II, fig. 1.)

Obviously all that is needed to rid the soil of such tracts of its excess of salts and to render it in all respects suitable for cultivation is the construction of drains, coupled with abundant irrigation. The soils are light enough and their slope is sufficient to render it an easy matter to wash out the salt in a short time. This the natives thoroughly appreciate. The writer saw several long-neglected gardens at Tozer that were in process of reclamation. In commencing operations the ground is worked over to a depth of 3 feet (Pl. II, fig. 2), and in case a heavy crust of salt has accumulated this is frequently scraped off and carted away. The latter operation is unnecessary, although doubtless helping to shorten the period of reclamation. Nowhere in the Jerid does there appear to be the least difficulty in reclaiming salt land if this method of flooding is followed. At Nefta, especially in the part of the oasis nearest the shott, new gardens of date palms are being established in land that is white with salt (Pl. VII, fig. 2). The natives agree that this can be removed very rapidly and completely if proper methods are used.

In the following table are presented the results of chemical analyses of soil samples taken in different parts of the oasis of Tozer, the first six numbers being identical with those in the table of mechanical analyses on page 34.

TABLE 11.—*Chemical composition of soils of Tozer oasis.*

No. of sample.	Description of locality where sample was taken.	Depth of sample.	Percentages of water-soluble components based on dry weight of soil.		Percentage of calcium carbonate based on dry weight of soil by acid digestion.
			Calculated from electrical resistance of saturated soil.	By chemical analysis of solution in 20 parts water to 1 part soil.	
		Inches.			
1	Open ground, surrounded by date gardens, much white saline efflorescence on surface; growth of salt-loving weeds.	0 to 36	2.90	6.58	14.29
2	In garden adjoining No. 1, among young, thrifty Deglet Noor palms planted the year before in a thin stand of alfalfa.	0 to 36	.54	5.33	12.84
3	In land, recently broken up for reclamation, of a neglected garden where palms had suffered from lack of irrigation.	0 to 24	.20	4.82	10.24
4	In land still uncleared and covered with a dense growth of weeds and grass, in same garden as No. 3.	0 to 36	.30	5.37	16.32
5	In unirrigated land lying higher than surrounding gardens; heavy efflorescence; scattered, stunted palms; growth of salt-loving weeds.	0 to 36	.58	3.99	13.73
6	Same boring as No. 5, lower depth.	36 to 72	.96	5.78	11.95
7	In garden among young Deglet Noor palms and a good stand of alfalfa; water at 36 inches.	0 to 36	.2	----------	----------
8	In unirrigated land outside garden in which No. 7 was taken, amid a growth of salt-loving grass and rushes; water at 24 inches.	0 to 36	.97	----------	----------
9	Saline crust from neighborhood of main drainage ditch; very little vegetation.	0 to 1	----------	54.1	5.39

The following table gives the composition of the totals of water-soluble salts, of which the percentages, based on dry weight of soil, are given in column 5 of the preceding table:

TABLE 12.—*Composition of water-soluble salts in soils of Tozer oasis.*

Number of sample.	Constituents, by analysis.							
	Ca.	Mg.	Na.	K.	SO_4.	Cl.	HCO_3.	PO_4.
1	18.49	3.31	6.53	2.22	54.95	13.23	1.27	Tr.
2	25.19	1.50	.34	2.84	65.97	2.36	1.80	Tr.
3	21.19	.83	4.81	3.86	67.56	Tr.	1.75	Tr.
4	21.34	1.12	3.76	4.81	65.61	1.57	1.79	Tr.
5	24.71	2.10	1.00	1.65	63.23	4.90	2.41	Tr.
6	24.78	1.55	.62	3.18	64.83	3.38	1.66	Tr.
9	3.39	4.70	21.36	2.41	50.63	17.17	.34	Tr.

Number of sample.	Conventional combinations, calculated.								
	$CaSO_4$.	$MgSO_4$.	$MgCl_2$.	KCl.	K_2SO_4.	$KHCO_3$.	$NaHCC_3$.	NaCl.	Na_2SO_4.
1	62.82	13.29	2.49	4.22	----------	----------	1.73	15.45	----------
2	85.57	7.05	.30	4.46	----------	1.31	1.31	----------	----------
3	71.99	4.11	----------	----------	8.59	----------	2.37	----------	12.94
4	72.51	5.32	----------	----------	10.71	----------	2.46	2.56	6.44
5	83.92	5.07	4.31	3.15	----------	----------	3.31	.30	----------
6	84.20	6.81	.66	6.05	----------	----------	2.28	----------	----------
9	11.52	23.27	----------	4.59	----------	----------	.47	24.73	35.42

Upon examination of the data given in Table 11, a striking discrepancy is seen to exist between the percentages of water-soluble components to dry weight of soil, as stated in columns 4 and 5, respectively. By reference to Table 12, however, the explanation is found to be simple. In taking the electrical resistance of the sample, the soil was mixed with just a sufficient quantity of distilled water to bring it to the point of saturation, which in soils of this texture was found to be about 30 per cent of the dry weight of the soil; and the reading is taken as soon as the soil and water are thoroughly mixed. In making the chemical analyses, on the other hand, one part of soil is digested in 20 parts of water, and the mixture is allowed to stand twenty-four hours to bring it to an equilibrium before it is filtered.[a] By the second method the soil is in contact with from 60 to 100 times as much water as by the first method, and for nearly 288 times as long. Consequently a great amount of calcium sulphate goes into solution when the soil is prepared for chemical analysis that remains in the solid state and is hence unaccounted for in the samples as made up for a test of electrical resistance. By reference to column 2 of Table 12 it is seen that (except in sample 9) calcium sulphate amounts to from 60 to 85 per cent of the total water-soluble matter, of which only an insignificant fraction can be dissolved in the amount of water and with the limited time allowed for taking the electrical resistance.

It should be said in this connection that experiments have shown a saturated, pure solution of calcium sulphate to be harmless and even beneficial to plants, and that an excess of calcium sulphate in the presence of magnesium and sodium salts has an extraordinary influence in modifying the toxic action of the latter.[b] The calculations of water-soluble contents of the soil based upon the electrical resistance, although confessedly only rough approximations, are of some value as indicating the amount of the readily soluble and actually harmful saline contents of the soil. On the other hand, they do not include the gypsum or calcium sulphate that is present, and thus do not tell the whole story. If the latter were merely neutral, it could simply be deducted from the total salts as ascertained by chemical analysis; but as it plays an important part in counteracting the effect of the sodium and magnesium salts, its presence can not be ignored.

[a] For a description of the methods used, see Cameron in Bul. 18, Bureau of Soils, U. S. Dept. of Agriculture, pp. 66 and 67. For a discussion at some length of the significance of the high gypsum content of these soils, see W. T. Swingle, Bul. 53, Bureau of Plant Industry, pp. 73 and 74.

[b] Compare Kearney and Cameron in Report No. 71, U. S. Dept. of Agriculture, p. 39.

Turning to Table 12, let us compare the different samples as to their chemical composition. We notice at once that sulphuric acid is the acid and calcium the base which largely predominate in all of them, excepting sample No. 9. The latter, consisting of the efflorescence that is brought out on the surface of the soil by the combined action of capillarity and evaporation, is necessarily deficient in the slightly soluble calcium salts.[a] In the crust, as well as in the soils, however, sulphuric acid is by far the most important constituent. We may therefore regard the "alkali" of Tozer oasis as of the sulphate type.[b]

Free carbonates were not detected by the phenolphthalein test, either in the field or in the laboratory, except in the crust (sample No. 9), in which a very faint alkaline reaction was observed upon testing the freshly collected sample. In all other cases the reaction was neutral, not only at the time the samples were collected, but four months afterwards when examined in the laboratory. "Black alkali," therefore, apparently does not exist in Tozer oasis. The high percentages of calcium carbonate obtained by acid digestion of the soils (see column 6 of Table 11) would suggest the possibility of its formation under certain conditions were it not for the relatively small amount of sodium and the great quantity of calcium and sulphuric acid present.

The percentages of potassium and of carbonic acid differ comparatively little in the different samples, while those of sodium and of hydrochloric acid show very considerable variation. The relatively small part played by hydrochloric acid is surprising, when we consider that in the adjacent Shott Jerid mines of table salt exist. The smooth crust of salt that covers the bottom of the shott has the appearance of containing a higher percentage of sodium chlorid than do the efflorescences upon the soils of the oases, the latter being of the fluffy, powdery aspect which the presence of a large amount of sulphates generally produces.

It is interesting to note the difference in composition between the efflorescence (sample No. 9) and the soil solutions (samples Nos. 1 to 6). In addition to the very small percentage of calcium in the crust, as compared with the soil samples, we remark in the crust a considerably higher percentage of magnesium, a very much higher percentage of sodium and of hydrochloric acid, and a much lower

[a] In discussing "alkali" soils of Utah, Gardner and Jensen (Field Operations of the Division of Soils for 1900, p. 231) remark: "Lime is always present in the soil alkali in appreciable amounts, whereas in the crusts it is usually absent."

[b] In the soils of the Oued Rirh oases, in Algeria, also, sulphates generally predominate over chlorids, although the converse is frequently true. (See Bul. 53, Bureau of Plant Industry, p. 96; and Bul. 80, Bureau of Plant Industry, p. 46.)

percentage of carbonic acid. In respect to potash and sulphuric acid the difference is not noteworthy.

It remains to consider the composition of the drainage water. A sample was taken from the "Khandak-el-Kebir," the main drainage ditch of the oasis of Tozer (see p. 33), at a point some distance beyond the last garden toward the shott. This sample, like that of the irrigation water described on page 30, after having been kept for two months in a rubber-stoppered bottle, remained perfectly sweet and good. Tested with phenolphthalein as soon as it was collected, the water showed a very faint pinkish opalescence, indicating a slight trace of free carbonates. An analysis of this sample in the laboratories of the Bureau of Soils showed the presence of 530.4 parts of salts per 100,000 of water, which is a little more than two and one-half times the amount found in the irrigating water (see p. 30). Water of this concentration could be safely used in irrigating many crops,[a] and considering the fact that the drains penetrate everywhere, and that the sample was collected at a season (February 5) when comparatively little irrigation is going on, its relatively small salt content indicates that the soils of the oasis generally are not highly saline.

TABLE 13.—*Chemical composition of drainage water, Tozer oasis.*

Percentages of different constituents.		Conventional combinations.	
Calcium	9.97	Calcium sulphate	33.88
Magnesium	5.30	Magnesium sulphate	16.54
Sodium	8.67	Potassium chlorid	16.70
Potassium	8.77	Magnesium chlorid	7.69
Sulphions	37.11	Sodium chlorid	14.80
Chlorions	22.64	Sodium bicarbonate	10.39
Carbonic acid	7.54		
	100.00		100.00

Comparing the percentage composition of the saline matters in the drainage water with that of the irrigation water, we find a remarkably close agreement. As compared with the soil samples (Nos. 1 to 6 in Table 12), the drainage water contains relatively much more magnesium, sodium, and potassium and very much less calcium. In respect to acid constituents there is relatively much less sulphuric acid and much more hydrochloric and carbonic acids. In comparison with the salt crust, of which a sample was taken near the spot where the water sample was collected (sample 9 in Table 12), the drainage water contains relatively much more calcium, potassium, and carbonic acid and considerably more hydrochloric acid. On the other hand, it is much poorer in sodium and is considerably poorer in sulphuric acid than is the crust.

[a] See T. H. Means, Circ. 10, Bureau of Soils; and Bul. 80, Bureau of Plant Industry, p. 38.

When we consider the great predominance of calcium sulphate and the absence of easily soluble carbonates ("black alkali") in the soils of Tozer oasis, it is apparent that the type of "alkali" occurring there is a relatively harmless one. In view of the relatively small percentages of readily soluble salts, as indicated by the electrical resistances of the soils of well-kept gardens, and taking into account the thorough drainage system of the oasis, the "alkali" problem can not be regarded as a very serious one in this region.

CULTURE OF THE DATE PALM.

As the gardens of the Jerid only were investigated in any detail, the following notes relate principally to that region, although most of the observations are doubtless equally applicable to the other oases of southern Tunis. Cultural methods could not be given the thorough investigation the subject warrants, the writer's time having been mainly taken up in studying the characters of the different varieties and in getting together the collection of offshoots for shipment to the United States. Yet it is thought that some of the information obtained will offer useful suggestions to future date growers in this country. The following discussion is based partly upon notes obligingly furnished by M. Minangoin, inspector of agriculture at Tunis, and upon the published paper of M. Masselot,[a] and partly upon data obtained by observation and by questioning the inhabitants. In regard to the latter source of information, it should be said that while the cultural methods used by the Arabs appear to have generally a common-sense foundation, the reasons which they give for their practices are often extremely childish. As a rule, they follow slavishly the precepts that have been handed down to them by wiser ancestors, without concerning themselves about why they do this or that. Yet, occasionally one meets an intelligent native who can give a rational explanation of most of his proceedings.

SIZE AND VALUE OF THE GARDENS.

The size of the date gardens varies greatly. The largest in the Jerid is said to be that of Dobech, at Nefta, in which there are 2,800 palms. The writer was told that the annual revenue from this garden is from $4,500 to $5,000. At Tozer the largest garden, that known as "Mahaleb," is said to yield the owner $3,400 a year. The garden of Tishta, at Nefta, is remarkable for the large number of varieties it contains. It was formerly the property of a caid, whose hobby it was to collect as many different sorts as possible. Practically all

[a] Les Dattiers des Oasis du Djérid. Bul. Dir. Agr. et Com., Tunis, 1901, pp. 114–161.

of the gardens in the Jerid belong to natives. French capital has not been engaged here, as in the Oued Rirh oases of Algeria, in establishing plantations of date palms.

According to official estimates there should be about 96 trees to the acre in the gardens of Tozer, but in reality they are much more densely crowded, only taxable palms, i. e., those in full bearing, being enumerated by the census takers. As many proprietors estimate the value of their gardens at the rate of $19 per tree in full bearing, an acre containing 96 date palms in good condition would be worth $1,824. But since the value of a palm depends largely upon the variety to which it belongs, and as most of the gardens contain many trees of inferior varieties mixed with the better sorts, it is probable that the figure mentioned is too high as an average for the whole region. On the other hand, an acre of Deglet Noor palms in full bearing would doubtless be worth even more; but there are very few gardens in the Tunis oases in which the Deglet Noor variety constitutes even one-half of the total number of trees. At Nefta, according to official estimates, the average number of trees per acre is 125, while in the neglected oasis of El Hamma it is only from 62 to 75.

Each garden is surrounded by a "tabia," or wall of mud, surmounted by a palisade of palm leaves, the whole being generally 5 or 6 feet high.

LABOR AND TENANTRY SYSTEM.

Labor is abundant and very cheap in that part of the world. The inhabitants of the oases, having devoted themselves for many centuries to the culture of the date palm, are thoroughly familiar with every detail of it, although the great majority of them carry on the necessary operations instinctively rather than intelligently. For the ordinary work of the gardens an abundance of labor is available; but for operations demanding especial skill, such as detaching suckers for planting, pollinating the flower clusters, and gathering the fruits of the best varieties, experts are required, and these are much less numerous.

At Nefta and at El Oudiane many of the owners manage their own gardens, while others employ a tenant, or "khammes." At Tozer the latter system is all but universal, and in consequence the gardens are often less well kept. The khammes is so-called from the fact that he is supposed to receive one-fifth of the product of the gardens, khammes being the Arabic word for "fifth." As a matter of fact, this manner of payment no longer obtains in the Jerid. Nowadays the khammes is entitled to one-eighth of the yield of trees of all varieties, except the Deglet Noor, and to one bunch of fruit from each ten trees of the latter kind. In addition, he is permitted to raise

vegetables, forage crops, and grain in the gardens (Pl. VII, fig. 2) and he is allowed as much as he wishes of these products for his own use, besides one-fourth of the proceeds of what is sold.

In return, the khammes is expected not only to carry on all the work of the garden—irrigation, cultivation, manuring, pollinating the female flower clusters, etc.—and to keep in repair the ditches for irrigation (seguias) and those for drainage (khandaks), as well as the walls (tabias), but, when he has any spare time, to do domestic service for the proprietor. During the season when the fruit is ripening and needs to be guarded night and day to prevent its being stolen the khammes and his sons often camp in the garden, inhabiting a small tent or even sleeping in the open. At other times the gardeners and their families live in the towns, going each morning afoot or on donkey back to their work. There are no permanent habitations among the gardens, as the towns, being situated on higher, dry land (Pl. VI, fig. 3), are considered healthier. Even under these circumstances, however, the population of the Jerid is ravaged in summer and early autumn by malaria. The population, as a whole, is anemic, feeble, and subject to various diseases, notwithstanding the fine winter climate.

PROPAGATION.

In Tunis, as elsewhere in the Sahara, the date palm is intentionally propagated only by means of the offshoots that spring from the base of the trunk (Pl. V), which, in well-cared-for gardens, are taken only from trees belonging to good varieties and known for the quality of their fruit. But in neglected gardens and in waste ground many seedlings ("el hachana") spring up fortuitously, and in this way doubtless the many varieties have arisen. Seedling palms are, of course, rarely true to type, although the writer was gravely assured by an intelligent Arab that to make them come true it is only necessary to transplant them two or three times, and that this method is sometimes resorted to when suckers are not procurable, in order to perpetuate very rare varieties!

Manuring and watering freely are said to stimulate suckering, and the construction of a "dokana," or circular mound of earth and clay[a] (Pl. V, fig. 2), around the base of the palm is a good way to obtain strong, well-rooted offshoots. If an offshoot starts from the trunk some distance above the surface of the soil it can be made to take root by cutting away the outer leaves and fastening a basket filled with earth around its base. Offshoots produced by palms growing in open places, unshaded by other trees, are considered to

[a] Illustrated also in Bul. 86, Bureau of Plant Industry, Pl. V, fig. 1.

give the best results.[a] Some of the inhabitants of the Jerid are of the opinion that offshoots developed in unirrigated and salty land make more vigorous palms than those grown in well-tended, frequently irrigated gardens. It is possible, at least, that such offshoots are hardier at the start and are less likely to perish in the early stages of growth.

The offshoots are generally of sufficient size to transplant when two or three years old, but they must not be taken up until they are well rooted. The natives say they are of the best size for planting when about as large as a camel's head at the base, but while still without a well-formed trunk above ground. One offshoot is generally left attached to each palm when the others are removed, in order to replace it when it dies or becomes unproductive. When this in turn produces offshoots, one of these is retained, and so on. Hence it is not unusual to see trunks belonging to several generations all still attached to the same parent stock. (Pl. V, fig. 2.) It must be remembered that a date palm generally ceases to sucker after it is 10 to 15 years old.

FIG. 3.—Laborer holding a "messah," or short-handled hoe.

The price paid for offshoots in the Jerid depends upon the variety, Deglet Noor offshoots selling for from 57 to 75 cents apiece, while those of most other varieties cost only from 19 to 57 cents.

FIG. 4.—Date picker holding a "mengel," or straight-bladed sickle, used for cutting off the bunches of dates.

Considerable skill is required in detaching the offshoots from the parent stem. First, all but the innermost leaves are cut off near the base, and those that are left are often fastened together with a shred of palm leaf, to prevent their being broken during the operations. Next, a hole of some size is dug around the offshoot with a pick or with the "messah," a short-handled hoe. This tool (fig. 3 and Pl. II, fig. 2) is quite unlike the Egyptian "fass,"[b] having a much larger, shovel-like blade, with the handle so attached as to be nearly parallel with the blade instead of at right angles to it. At the same time all the roots that can be reached are cut off close to the base by means of a "mengel," a tool with the

[a] The belief among the natives is that an offshoot must receive plenty of moonlight in order to become a strong palm!

[b] Illustrated in Bul. 130, Office of Experiment Stations, U. S. Dept. of Agriculture, 1903, p. 39.

shank and blade made in one piece of wrought iron and fitted with a wooden handle. It somewhat resembles a sickle, but has a straight, heavy, saw-edged blade nearly at right angles to the shank (fig. 4). One man then grasps the offshoot and pulls down on it, while another, armed with a chisel or a pick, pries it loose at its point of junction with the parent tree. The remaining roots are now cut off, and the sucker is ready to be planted. The cost of thus removing a sucker is generally 6 cents.

If the offshoot is to be transported a considerable distance before it is planted, it must be protected from drying by a wrapping of the coarse fiber (leef) that invests the bases of the leaf stalks of the date palm (fig. 5) or of some similar material.

PREPARING THE LAND.

The methods used in preparing the soil, especially if it contains "alkali," are essentially the same whether the plantation is to be made in new land or in an old garden that has been neglected. First, the irrigation and drainage ditches are dug or are cleaned out. Next, the soil is worked thoroughly to a depth of 3 to 6 feet with the short-handled hoe, or messah, this operation being accomplished by digging a trench of the required depth at one side of the garden and then working across. All stones, masses of gypsum, etc., encountered are carefully removed. The whole garden is then flooded to wash out whatever salt has accumulated near the surface of the soil. When that is accomplished, in order to facilitate irrigation the garden is divided up into "lands" that vary greatly in size, but rarely exceed 120 square yards (1 are). A donkey load of manure, carefully freed from straw, is frequently worked into the soil of each "land." Often, during the next two or three years, only vegetables, especially turnips, cabbage, and carrots, are grown before date palms are planted. It costs 14¼ cents to dig 15 feet of drainage ditch of the ordinary depth (5 feet), and from 4¾ to 13 cents annually to keep the same length in repair. Breaking up the ground with a messah costs from 28½ to $1.25 per 20 square feet, according to the depth of the hoeing and the character of the land.

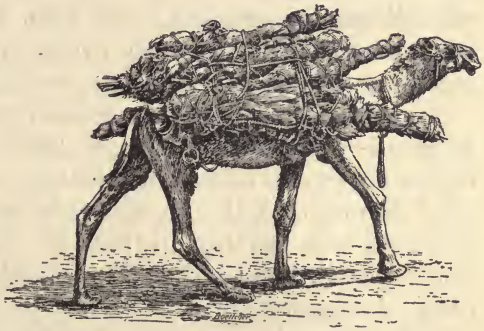

FIG. 5.—Camel carrying date offshoots wrapped in palm fiber (leef) for transportation.

PLANTING.

Planting is done in the Jerid during the months of March to June. It is said that in well-drained soils it can be begun with safety as early as March 1, but in very wet land must be postponed until a month later. At Gabes the amins say that if offshoots are detached in March, after the sap has begun to flow freely in the palm, the chances of their growing are better than if taken earlier, although they can be removed with little risk as early as February 15.

In the newer gardens of the Jerid the palms are generally set in with some attempt at alignment (Pl. VII, fig. 2) at intervals of 15 to 30 feet each way, 30 feet being recognized as quite sufficient for obtaining the maximum yields.[a] In the older gardens, as pointed out above, the trees stand at very irregular intervals and are often much crowded (Pls. I. and IV, fig. 2). The holes made to receive the offshoots are usually $3\frac{1}{3}$ feet in diameter and about $1\frac{1}{2}$ feet deep in new land, while in replacing an old or diseased palm the hole is made 3 to 6 feet deep, probably in order that as much as possible of the old soil may be removed. The hole is then filled with well-washed sand, which is trodden down firmly around the base of the offshoot as soon as it is set in and again after the first irrigation.

A practice that is highly recommended, particularly in gardens where the water table is high, is that of placing stones in the bottom of the hole so as to support the base of the offshoot, thus insuring good drainage. This custom has fallen into disuse in the Jerid, but when old trees are dug up there it is said that stones are frequently found among their roots. The practice still prevails in the Mzab oases of Algeria.[b]

It frequently happens that the offshoot is more or less curved. To make it develop into a straight palm, it is recommended to plant it with the concave side facing southeast, "like a man saying his prayers," as the Arabs express it. The young palm, thus receiving more of the sun's rays on its concave than on its convex side, gradually becomes straight.[c]

[a] There is a proverb current among the inhabitants of the Mzab oases in Algeria (quoted by Charlet, Les Palmiers du Mzab, Bul. Soc. Géogr. d'Alger, 1905) to the effect that "If one plants at 30 cubits, one has dates without trouble; if one plants at 20 cubits, one has them only by taking great pains; but if one plants at 10 cubits, it is labor wasted."

[b] Charlet, Les Palmiers du Mzab, Bul. Soc. Géogr. d'Alger, 1905.

[c] The same practice occurs in the Mzab oases, according to Charlet (Bul. Soc. Géogr. d'Alger, 1905). This author makes the interesting statement that suckers sometimes finally grow that have shown no sign of life for one and one-half to two years after being planted. The natives say that growth can sometimes be started in such a case by transplanting to another part of the garden. They believe that the offshoot had willfully refused to grow in its first station on account of the dislike it had taken to some neighboring palm.

The cost of planting a palm is about 2½ cents, but in already established gardens the work of replacing old or diseased palms is part of the regular duties of the khammes, or tenant, for which he receives no extra compensation.

The young palm is usually sheltered by a tentlike covering of date palm leaves (Pl. II, fig. 2), until it is strong enough to face without protection the summer sun and the cold winds of winter. The shelter is generally left in place for a year, i. e., until the spring after the planting. Where palms are planted on the edge of an oasis, and hence beyond the shelter of older trees, "tabias," or palisades, to break the force of the sand-bearing winds (see p. 14), are often erected at intervals of 30 to 50 feet in the young plantation. It is estimated in the Jerid that from 10 to 15 per cent of the suckers planted fail to grow.

IRRIGATING.

As soon as the offshoot is planted a shallow basin is made around its base, in order to hold the irrigating water. Care is taken to construct this so that the water can not come in contact with the terminal bud, or "heart," of the young palm. During the first forty days after planting, many of the natives consider it preferable to water palms by hand from a water jar, at the rate of 4 gallons for each palm daily, rather than by flooding. It costs about 20 cents to water 30 palms daily in this way. After forty days two waterings a week are generally sufficient. At Nefta the growers told the writer that the practice is to water palms, until they are one year old, every day in summer, every four days in spring, and every eight days in autumn. If irrigated by flooding, two irrigations a week are generally sufficient, at least after the first few weeks, and two a month in rainy seasons, e. g., in autumn.

For older palms irrigation by flooding small basins, each containing several palms, is the only method practiced. One irrigation a week is generally sufficient, although a marked increase in yield is said to be obtained by irrigating twice a week. But many proprietors of gardens at Tozer, having disposed of part of their water right, get water only once or twice a month. According to an estimate made by M. Minangoin, water is ordinarily put on the land to a depth of about 2½ inches, of which nearly 1 inch is almost immediately absorbed by the soil. M. Masselot, however, states that the "lands" are flooded to a depth of about 4 inches at each irrigation. The amount of water theoretically available for each palm in the oasis of Tozer is variously estimated at from 42 to 62½ gallons daily. (Compare p. 29.)

Irrigation is most urgently required during the hot, dry months of June, July, and August, when the fruit is developing, and again in

November and December, after the harvest, the trees being at that time particularly weak and in need of stimulation. Irrigation throughout the winter is regarded as an excellent practice, as it stores the soil with water and makes it possible to get along with a smaller amount when the hot weather first begins. Land that is left entirely without water during the winter is said to become so dry that the first irrigations in summer can only wet the soil to a slight depth and the trees suffer from lack of water at the very time they need it most. In winter, however, irrigations are given much less frequently than at other seasons. It is said to be customary in winter to flood the whole garden at once, rather than to turn the water into small basins one at a time. Nor is so large a quantity of water necessary at each application, as it is not thought well to let the water stand on the land for any considerable length of time in winter, and the evaporation is naturally much less than in summer. Judging by the height of the ground water in the gardens of Tozer in midwinter (February 5), it would appear that the soils of the oasis are always in a very wet condition. Compare column 3 in Table 9, page 34.

No water should be applied for two or three weeks after the pollination of the female flower clusters in spring, as irrigation at that season causes the newly set fruit to drop off. Nor is it advisable to irrigate in the autumn for three or four weeks preceding the harvest, as otherwise the ripening fruit falls or else becomes so juicy that it molds easily and can not be preserved. Many gardeners withhold water from their palms from about the 1st of October until the dates are gathered.[a]

It has been pointed out in discussing the character of the drainage water (see p. 40) that this is not too saline for irrigation purposes. As a matter of fact, some of the gardens at Tozer lying nearest the Shott Jerid, and hence in the lowest part of the oasis, are irrigated solely with water from the drains. It is true that the palms are less thrifty and the yields obtained are smaller than elsewhere, but this is at least partly attributable to the poorer quality of the soils in that quarter and to the fact that in summer, when water is most needed, the drains are frequently empty.

[a] Charlet (Bul. Soc. Géogr. d'Alger, 1905) mentions that the same rule in regard to spring and fall irrigation obtains in the Mzab oases, where the application of water ceases about September 15, to be resumed after the harvest is completed.

MANURING.[a]

The continual irrigation of the oases and the small extent to which leguminous crops are grown among the palms are probably responsible for the low nitrogen content of the soil, as shown by the analysis on page 35. As far as possible the natives seek to remedy this deficiency by manuring. Unfortunately, owing to the small number of domestic animals kept, the supply of stable manure is very limited and the use of chemical fertilizers is as yet unknown.

No manure is given to the young palms when first set out, although where garden vegetables are grown in new land that is being prepared for a date orchard, as shown on page 45, the suckers doubtless receive some benefit from the manure that had been applied to the vegetables during the two or three preceding years. When the palm is 3 years old and is beginning to sucker it is manured directly for the first time. A circular trench is dug around the tree, at least 3 feet from its base. This is filled with one part of manure to two parts of earth, thoroughly mixed together. Frequently only one-half of the trench is dug and filled the first year, the circle being completed the year following. Subsequently the palm is usually manured only every four years, although some gardeners prefer to give a smaller application every year.

In the case of older palms the manure is spread on the surface and then worked into the ground, being applied at the rate of one donkey load to each tract of 7 square yards. Strong soils, containing a high percentage of clay or of organic matter and gypsum, are manured less heavily than the light sandy soils. Where garden vegetables are grown among the palms and manured every year the palms themselves receive no separate application. The best time to manure date palms is considered in the Jerid to be from October to January.[b]

Only thoroughly rotted manure that is at least one year old can safely be used. The natives recognize it as one of the advantages of old manure that it contains fewer viable weed seeds. Grass and straw are carefully removed before the manure is applied. The inhabitants differ as to what kind of manure gives the most satisfac-

[a] For the practices in this regard in the Oued Souf, see Bul. 86, Bureau of Plant Industry, pp. 22–24.

[b] According to Charlet (Bul. Soc. Géogr. d'Alger, 1905), many of the inhabitants of the Mazb manure their palms every year, sometimes at the beginning of winter and sometimes in February when the sap begins to run. This author estimates 44 pounds of manure as the quantity needed annually by each palm. In the Oued Souf (Bul. 86, Bureau of Plant Industry, p. 23) October and March are considered the best months for applying manure.

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tory results with the date palm, some advocating that of camels, others that of donkeys.[a] But the total supply is too limited to allow of much choice in this respect, and every source is drawn upon, even to the scrapings of chicken yards and the refuse from human habitations.

OTHER CULTURAL METHODS.

When the palm has reached the age of 2 years, the old leaves and leaf stalks are trimmed off for the first time, but not too close to the ground, as in that case no suckers will develop. On the other hand, if left on the trunk these parts decay and sometimes cause the central bud to rot. It is considered important to work the soil around the palms to a moderate depth in the second and again in the third year after planting. Thereafter the ground should be worked over as often as possible. All cultivation is laboriously done with the messah, or short-handled hoe (see Pl. II, fig. 2, and text fig. 3, p. 44).

It is considered advisable not to permit the development of the earliest fruit clusters (which sometimes appear when the tree is only 4 years old), as too early production diminishes the vigor of the palm. In regard to the choice of other fruit trees to be planted among the date palms, figs and olives, being relatively shallow rooting, are recommended in preference to apricots, the latter being deep-rooted trees that compete with the palms themselves.

POLLINATION AND MALE PALMS.

The operation of pollination, which was not witnessed by the writer, has been described from personal observation by Mr. W. T. Swingle.[b] It is said to take place in the Jerid usually from March 15 to April 15. Male palms are not distinguished there according to variety, but according to their time of flowering, whether early, intermediate, or late,[c] and also, it is said, according to whether they originate from seed or from suckers. As a rule, the male palms resemble each other much more closely than do the female palms belonging to different varieties. They are distinguished from female palms in general by more numerous leaves and leaflets (Pl. IV, fig. 2) and often by a stouter trunk. According to M. Minangoin, the leaf stalks of male palms are very stout and the foliage is fine and soft looking.

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[a] One owner of a garden assured the writer that camel manure is "too strong" to be used in irrigated land, although it can be applied with perfect safety under the conditions prevailing in the Oued Souf.

[b] Bul. 53, Bureau of Plant Industry, pp. 26–29.

[c] Five suckers of each type of male palm, 15 in all, were imported into the United States from the Jerid.

In the Jerid oases, males constitute a very small proportion of the total number of palms. One male is said to furnish sufficient pollen for fecundating 500 to 600 females. In the most extensive garden of Tozer oasis the writer was shown an unusually large and fine male which he was told served not only for all of the fruiting palms in this garden, considerably more than 1,000, but for neighboring gardens as well. The flowers of male palms are said to be free to all who wish to use them, without compensation to the owner. The males are reputed to live longer than the females, but finally become so tall that it is difficult to gather the flower clusters. They then share the fate of female palms that have ceased to bear, the terminal bud being girdled in order to extract lagmi, or palm wine, an operation that sooner or later results in the death of the tree.

The writer saw, in February, a palm (illustrated in Pl. IV, fig. 2) which had all the characters of a male, as the tenant of the garden in which it grew declared it to be. Nevertheless, it bore clusters of small, seedless green dates, similar to the "sichi" (unfecundated) fruits of the Fteemy variety (see p. 70). Although the only case observed by him, this is apparently a rather well-known phenomenon.[a]

RIPENING.

The bunches of dates often become too heavy for the stalks that bear them. To prevent the breaking of the fruit stalks the clusters are therefore frequently "straddled" upon the nearest leafstalk, as shown in Plate III. This is an operation that requires considerable skill, and, in the case of choice varieties, is usually intrusted to an expert.

Much rain during the first few weeks after pollination is as injurious as irrigation at that season, causing the newly set fruit to drop. On the rare occasions when rain falls during the months of May, June, and July—that is to say, after the fruit has set and before it begins to ripen—it does no harm. During the early autumn, when the dates are maturing, hot, dry winds from the south and west are favorable, as they hasten the ripening process and prevent the fruit from becoming wormy. On the other hand, a heavy rain at this season is disastrous. If it falls in August or September it will cause the fruit to drop before maturity; if a little later, the fruit tends to rot or to become moldy. When the dates have become perfectly ripe a light rain is rather beneficial than otherwise, as it softens them and washes off the dust that has gathered on them. But a heavy rain

[a] J. W. Toumey (Bul. 29, Ariz. Exp. Sta., 1898) notes the fruiting of male date palms at Phoenix, Ariz., and at La Paz, Mexico. Charlet (Bul. Soc. Géogr. d'Alger, 1905), mentions the existence of two fruiting male palms in the Mzab oases.

causes the ripe fruit to sweat and, while not injuring its flavor, lessens its exportability. The relation between the late summer and autumn rainfall and the quality of the dates is brought out in Table 4, on page 25.

To illustrate the opinion of the inhabitants of the Jerid concerning the effect of rain in early autumn upon their principal crop, the following anecdote, current among them, is related by Masselot:[a]

> Once upon a time, after several years of drought and at length of famine, the bey had ordered that public prayers for rain be said throughout the regency. The people of the Jerid, alone among his subjects, refused to obey the order of their sovereign. The latter, in anger, ordered the chief notables among the refractory inhabitants to come to Tunis to receive punishment, had them appear before him, and said to them: "How happens it that when I command public prayers in order to attract God's attention to us and bring us the blessed rain that will give wealth to our unhappy country, you alone should dare to disobey this order, given in the general interest?" "You have acted rightly," replied the chief men of the Jerid, "but so far as our country is concerned, rain would have been its ruin. Behold this soft and fragrant ball of honey. Add a little water to it and what does it become? A coarse, tasteless liquid. Such are our dates, which in order to produce their honey require many rays of the sun, but not a drop of rain." The bey was convinced, it is said, and permitted them to return to their homes.

It is said that Deglet Noor dates should not be gathered much before the end of October, as, no matter how perfect their condition seems to be, if harvested earlier they will discolor and become wormy within a few weeks. It was suggested by a date buyer at Tozer that by cutting about one-third way through the main stalk of the fruit cluster when the dates begin to mature, and thus shutting off part of the water that passes through the stalk, the fruits can be made to ripen earlier without injury to their keeping quality. The experiment is at least worth trying. It is said that Deglet Noor dates can also be ripened faster by removing the bunches when the dates begin to soften and hanging them up in dry rooms.

HARVESTING.

Different varieties of dates mature at different periods, the earliest in the Jerid commencing to ripen in August, or even toward the end of July, while the latest are not all ripe before December. Consequently the harvest goes on in this region during about five months. The gathering of the Deglet Noor dates is done with especial care, as they are the only kind that is exported in any quantity to Europe. The harvest of this variety begins in earnest toward the end of October (about October 25 in 1904) and often continues into the first days of January. Of course, all the fruit that will ripen has matured long before the latter date, but the skilled laborers re-

[a] Bul. Dir. Agr. et Com., Tunis, 1901, pp. 122, 123.

quired are not sufficiently numerous to gather all the fruit as soon as it is ready to harvest. Fortunately, this is one of the varieties the dates of which can be left on the palms without injury for several weeks after maturing, provided the autumn is a dry one.

The Deglet Noor crop is generally purchased on the trees and the harvest is supervised by the buyer or his agent. Bunches borne on small trees which can be reached from the ground are said to be preferred by the more wealthy natives for their own consumption, being less liable to injury in the harvesting. Palms in full bearing, however, are generally too tall to allow their fruit to be gathered thus easily. The harvest from such trees is a rather complicated matter, giving employment to a large number of men. (Pl. I, frontispiece.)

First there is the "getaa," whose work requires the most skill. Armed with a "mengel" (see fig. 4, p. 44) he climbs to the top of the palm, cuts away with a few deft strokes such of the dead leaves as hang in his way, and then proceeds to sever the stalks of the fruit bunches. Along the trunk below him a sort of human ladder has meanwhile been formed, the number of men and boys that compose it depending of course upon the height of the tree. The writer saw eight men besides the getaa clinging to one tall Deglet Noor palm. Supporting themselves with one arm around the trunk and grasping the scaly bark with their bare feet, they hand down the bunches from one to another as they are received from the getaa until the entire product of the tree is safely on the ground. The tree is thus stripped with wonderful celerity, to the accompaniment of a shower of the ripe fruits that become detached from the bunches.

The getaa receives from 38 to 57 cents per day for gathering Deglet Noor dates, while the "meddada," who pass the bunches down the trunk, are each paid 19 to 24 cents per day. Even after the dates reach the ground they are handled by a little army of men and boys, each of whom has some small duty in connection with the harvest.[a] Thus the "lagata" are occupied solely in picking up the detached dates that fall while the bunches are being cut and passed to the ground. Each of them is paid 12 to 15 cents a day. The "adal," whose duty it is to carry the bunches to the central point where the product of the whole garden is collected, are entitled to from 19 to 24 cents each. The "batah," or men who guard the heap of dates and the belongings of the workmen, receive the same wages. The "jerrara" transport the dates from the garden to the storehouse, and receive for each donkey load about 11 pounds of dates that have dropped off the bunches. Then there is the "alleg," who loads the

[a] It is said that the owners of gardens are held to be acquitted of their obligation as good Mohammedans to devote a tithe of their incomes to charity if they give employment during the date harvest to a sufficient number of the poor of the oasis.

animals for the "jerrara," and the "khartaf," who attaches cords to the bunches and brings them to the "alleg" and who also arranges the bunches upon beams in the storehouse where they are dried.

It is said that one getaa can keep employed seven meddada, twelve lagata, two adal, six jerrara, one alleg, and one khartaf. In one day a skilled getaa can harvest the dates from 60 to 90 palms, according to the height of the trees. With the above-mentioned number of assistants of all classes, he can harvest on an average 5,500 pounds of dates daily.

Deglet Noor dates that are to be exported to Europe are often packed for shipment in the gardens where they are grown. A large part of the crop is put up in wooden boxes holding 22 pounds each, which is the maximum weight that can be sent by parcels post in a single package. (See Pl. I, Frontispiece.) They are then transported by caravan to the railway terminus, which is about 35 miles from Tozer.

The fruits of a few of the best varieties other than the Deglet Noor are harvested with the same degree of care. In the case of certain rare and highly esteemed sorts, especially of the earlier ripening varieties, the fruits are even picked one by one from the bunches as they mature. These are dates that are reserved for the tables of the wealthiest class of natives. But in harvesting by far the greatest number of varieties, including the popular Fteemy date, which constitutes probably more than one-half the total crop of the Jerid, the bunches, as they are cut by the getaa, are merely dropped upon mats spread on the ground underneath the palm, instead of being passed from hand to hand by the "meddada." In harvesting Fteemy dates the men are paid in kind. For each day's work the getaa is entitled to a bunch, which he selects among the finest, to two bunches of medium value, and to 11 pounds of detached fruit.[a] The other laborers are paid with a proportionate share of dates. For harvesting "khalt," or dry dates, the daily wage of the getaa is eight measures of fruit, amounting to about 88 pounds.

PRESERVING.

The fruits of the different varieties differ greatly in their keeping quality. Some must be eaten fresh, remaining edible at most only a few weeks after ripening. Certain kinds, including some that keep very well when ripe, are nevertheless preferred by the natives when in the "besser" stage; that is, before they are perfectly soft and ripe. These have the peculiarity of losing their astringency before they be-

[a] According to Masselot (ibid., p. 124), the total value of this quantity of fruit would be about 95 cents (5 francs). If this be true, the getaa receives about twice as much for harvesting Fteemy as for harvesting Deglet Noor dates, which seems improbable.

come very soft. Some kinds, both of soft and of dry dates, can be preserved several years without spoiling, although dry dates are apt to become excessively hard when kept for a long time. Soft, sirupy dates of good keeping quality, such as the Rhars and the Lagoo, are preserved in earthenware jars or in skin bags. The finer sorts, such as the Deglet Noor, are often hung up in bunches in the houses of the natives, and are picked off or else served on the branch as wanted.

It is said that the fruits of some varieties can be preserved only by leaving them on the bunch until they are completely dry, when they can be detached. Others which are especially liable to become wormy should be dried in the sun, after first splitting them open and removing the seeds.

VARIETIES OF THE DATE PALM IN TUNIS.

While it is impossible to state exactly the number of well-defined varieties of the date palm occurring in Tunis, it is probably not far from 150. The Jerid oases are particularly rich in varieties, containing considerably more than 100 distinct kinds.[a] Some of these are extremely local. At Nefta several varieties were seen that apparently do not occur at Tozer, while in the Nefzaoua there are many kinds that are very rare or entirely wanting in the Jerid, and vice versa. Yet certain varieties (the Kenta and Areshty, for example) are widely distributed, being found not only in all the Tunis oases, but also in those of eastern Algeria. Each group of oases in Tunis has its characteristic varieties. Thus, in the Jerid the Fteemy is by far the most abundant sort, while in the Nefzaoua, Gabes, and Gafsa groups it is rare or absent. Varieties such as Doonga and Zekry, which are important and highly esteemed in the Nefzaoua, are hardly known in the Jerid, although the nearest oases of the two groups are only about 30 miles distant. The Boo Hath'm variety, one of the most abundant at Gabes and at Gafsa, is apparently wanting in the two other groups.

Nearly all the gardens contain a large number of varieties, mixed together in the greatest confusion. Only in the newer gardens of the Jerid do we find plantations of the Deglet Noor occupying areas of some size, to the exclusion of other kinds. One large garden at Tozer is remarkable for containing almost solely the Deglet Noor and Fteemy varieties, but this is a rare exception. The present tendency is to plant Deglet Noor offshoots as fast as they can be obtained, and

[a] Du Paty de Clam published (Bul. de Géogr. Hist. et Descr., No. 3, 1893) a list of 74 varieties found in the Jerid. Masselot (Bul. Dir. Agr. et Com. Tunis, pp. 146–161, 1901) enumerates 94 named varieties. The writer was able to obtain fruit of all but 23 of these, and examined fruits of 21 named varieties not included in Masselot's catalogue.

very young plantations on the edges of the oases of Tozer and Nefta (Pl. VII, fig. 2) often contain only Deglet Noor and Fteemy palms.

In this bulletin only varieties that exist in the Jerid and Nefzaoua oases are treated. However, most of the important Tunisian varieties are thus included, there being few at Gafsa and at Gabes which do not also occur in one or both of the other groups. Descriptions are given of all the varieties that are at all abundant in the Jerid and the Nefzaoua, as well as of all that could be found that are noteworthy for their quality. Yet there are probably three times as many named and well-defined varieties in the region as are described in this paper; and the writer examined, photographed, and obtained samples of the fruits of nearly twice as many. Many of these, however, are extremely rare, in some cases being probably confined to a single garden.

Suckers of all the varieties described, with the exception of the Chedakh, Deglet Hamidatoo, Deglet Hassen, Khalt Menakhry, and Selatny, were brought to the United States.[a] Eleven varieties, of which suckers were imported, could not be included in the "Key to the varieties," at the end of this bulletin, as either the fruits were not seen or else samples and photographs were not obtained. Their characters, so far as known, are described under the heading "Varieties imported but not included in the key," page 90.

The Arabic names of the varieties alone are in use. In all matters of nomenclature and orthography Mr. W. T. Swingle, who has given much consideration to this subject, was freely consulted. In the main the names as given by the writer are identical with those given by Masselot,[b] although the spelling has been altered to the extent necessary to render it phonetic for English-speaking readers. The names of the varieties described in this paper which do not occur in Masselot's list are spelled phonetically as pronounced for the writer by the natives. In some cases, where the name of a variety differs in different oasis groups, the pronunciation current in the Jerid oases is followed as the standard.

At the end of this report, in the descriptive key (p. 97), the fruit characters that appear to be most useful for the identification of the varieties are described in detail. In the present chapter, brief descriptions of the fruits as to size, shape, flavor, and keeping quality, and in many cases of the characters of the palms themselves, are given. Geographical distribution, abundance or rarity, productiveness, earliness of ripening, commercial importance, vigor, rapidity of growth, and alkali resistance are also discussed.

[a] These five varieties are nevertheless described, the first because of its abundance, and the others because of their fine quality; and thus practically all the important varieties of the Jerid are treated in this paper.

[b] Bul. Dir. Agr. et Com. Tunis, pp. 146–161 (1901).

In classing the varieties as of first, second, or minor importance, such points as the size, flavor, earliness of ripening, and keeping quality of the fruit, the thickness of the flesh, and the proportionate size of the seed, as well as the rapidity of growth, hardiness, and productiveness of the trees have all been considered. Thus the Fteemy variety (Pl. X, fig. 3), although not ranking with the Deglet Noor (Pl. VIII, fig. 1) in respect to flavor and cleanness of skin, is yet a very attractive date and is remarkable for the ease with which it is propagated, its rapid growth, vigor, and productivity. Hence it has seemed advisable to place it in the first class, and the Kenta variety (Pl. X, fig. 2) has been inserted there for similar reasons. On the other hand, the Mokh Begry (Pl. X, fig. 4), although of delicious flavor and highly esteemed by the Arabs, is not as attractive as other kinds in the shape and size of its fruit, besides being a rather light bearer. Consequently it is ranked as of secondary importance.

It should be remembered that, in judging such characters as flavor, personal bias enters very largely into the equation. In regard to the fruits of several varieties, the writer's opinion did not at all agree with that of the inhabitants of the oases, nor has it always coincided with that of colleagues in the Department of Agriculture with whom he has compared notes in testing dates.

Another point that should be emphasized is the great likelihood that the varieties imported will undergo more or less change in their new environment, some improving and others deteriorating. It is by no means impossible that varieties which in Tunis appear to be second-rate or even of minor importance will take rank among the best when grown in the United States, and that some of the kinds that are classed in this paper as of first importance will not prove to be the best adapted to our conditions. At all events it will be extremely interesting to watch the behavior of the Tunisian varieties that have been introduced into the United States.

Among Tunis dates the Menakher variety (see also p. 60) must be given first rank, so far as the quality of the fruits is concerned. (See Pls. V and VIII, fig. 2.) These are fully equal to the Deglet Noor in flavor, cleanness of skin, and keeping quality, and are usually $1\frac{1}{2}$ to $1\frac{2}{3}$ times as large as the latter. The fruits appear to ripen earlier, and the trees are said to give considerably heavier yields than the Deglet Noor variety. Unfortunately Menakher palms are so extremely rare that only nine offshoots of this variety could be obtained for importation into the United States. Even rarer is the Selatny date (see fig. 52, p. 93), the fruits of which resemble and perhaps equal the Deglet Noor in flavor, and are as large as those of the Menakher. These two varieties are in fact nearly extinct. At the ordinary rate of propagation it would require a great many years to

obtain offshoots in sufficient numbers for commercial plantations. Yet the excellent quality and the large size of these dates would undoubtedly make them marketable at high prices if they could be had. So far as Selatny is concerned, there seems to be little chance of obtaining offshoots, but the Menakher variety has been introduced in sufficient number to give a fair opportunity for establishing it in this country. It remains to devise some means of speedy propagation by means of smaller offshoots than are generally taken for planting. Perhaps the offshoots can be removed before they have formed roots and then can be nursed in greenhouses until well rooted. The variety is so promising that no pains should be spared in multiplying it as rapidly as possible.

As regards actual commercial importance, the Deglet Noor variety is easily first. (Pls. VI, fig. 1, and VIII, fig. 1.) No other kind that is at all common equals it in quality. Its exquisite flavor, handsome appearance, cleanness of skin, and admirable keeping quality give it a deserved preeminence among the dates that are extensively grown in North Africa, and have made it the only Algerian or Tunisian date that is largely exported to Europe and America. Yet it has some serious disadvantages, else it would be hardly worth while to experiment in this country with any other variety. The greatest of these is its late ripening, or, in other words, its very high requirement as to total heat, a requirement that can probably be met in but very few localities in the United States. Another drawback is the relatively small average yield of the palms. In both these regards the Menakher variety appears to surpass the Deglet Noor, while equaling the latter in the quality and greatly exceeding it in the size of the fruits.

The Boo Affar (Pl. IX, fig. 2) is hardly inferior to the Menakher in many of the qualities of a first-class date. Its large fruits have a very fine flavor and very thick flesh, abounding in sugar. It is one of the handsomest of dates, being especially noticeable for its splendid coloring. The large size and unusual, almost perfectly globular shape of the Tronja date (Pls. IV, fig. 1, and IX, fig. 1) will at once attract attention. These peculiarities are associated with great thickness of flesh and a very rich flavor. Unfortunately, not much is known as to the productiveness of the variety. The Boo Fagoos (fig. 10, p. 67) is also remarkable for the form of its fruit, which is somewhat fiddle-shaped and of fairly large size. It has a very rich, attractive flavor, and, like the Tronja, is held in high esteem by the natives of the region where it grows. All three of these varieties offer great possibilities as a fancy dessert fruit, commanding a high price in the market.

The Tafazween (fig. 11, p. 68) is the best of the rather long, slender dates examined by the writer. It is decidedly attractive, with its

bright bay color and transparent flesh, nor does its flavor belie its appearance. It seems to be an earlier ripening kind than the Deglet Noor, and might be expected to take its place in regions where the sum total of temperatures is not quite sufficient to ripen the latter.

Although decidedly inferior in flavor and probably in keeping quality to the Deglet Noor, the Fteemy (Pls. VII and X, fig. 3) is a fine variety. It is by far the most abundant kind grown in the Jerid oases and is surpassed by none in productiveness, rapidity of growth, vigor, and hardiness. The fruit is handsome and highly colored, the flesh soft and sirupy, and the flavor so rich and sweet that Fteemy dates can not be eaten in large quantity at any one time. In the writer's judgment this is a finer fruit than the Rhars, that is so extensively grown in Algeria, although it shares with the latter the disadvantage of being sticky when fresh and consequently difficult to handle as a dessert fruit. It is a late-ripening sort, little if at all earlier than the Deglet Noor, and hence should not be planted except in the warmest localities of the Southwestern States. It has, however, a decided advantage over the Deglet Noor variety in point of rapidity and vigor of growth and in productiveness, being said to yield heavily every year.

Areshty (fig. 13, p. 71) is a variety considerably resembling the Boo Affar in size and shape, but is less richly flavored and less brightly colored. In its rather firm flesh and wholesome, moderately sweet flavor it resembles dates of the dry class. Were it not for the great size of its fruits it would be somewhat doubtful whether this should be classed as a variety of primary importance, as the flavor, although attractive, is not to be compared with that of the Deglet Noor and hardly equals that of the Fteemy variety.

The Horra variety (Pl. X, fig. 1) is very highly spoken of by French settlers in the oases, and is exported in small quantity to Europe. While from a botanical point of view it belongs to the "dry date" class, in reality its flesh is thick and never becomes very dry or hard. It is easily the finest of its type. The flavor is delicious, yet not so rich as to fatigue the palate. When we consider, furthermore, the good size of the handsome fruit, its early ripening, and the hardiness of the palms, there seems ample justification for giving the Horra a very high rank among Tunisian varieties.

Ranking next after the Horra among the dates of the dry type is the Kenta variety (Pl. X, fig. 2). This has a medium-sized fruit, smaller than the Horra. Its flesh is thicker and more tender than in most of its class. It ripens early, preserves well, and is one of the most productive of all varieties. The flavor is very agreeable and wholesome, while not so rich as to be easily cloying. Kenta palms appear to be unusually hardy and resistant to alkali in the soil.

DESCRIPTIONS OF THE VARIETIES.

In the descriptions that follow, the page number placed after the name of each variety refers to the descriptive key at the end of the bulletin (pp. 97–106), where a more detailed account of the characters of the fruits will be found. It should be noted that with few exceptions all the varieties can readily be referred to one or the other of two principal types—the "dry dates" and the "soft dates." (See p. 96.) The first are characterized by having the skin of the ripe fruit mostly roughened with numerous hard, narrow, transverse, as well as longitudinal, wrinkles, while the flesh is usually thin and generally becomes quite hard and dry in fruit that is long preserved. Plate X, figure 1, illustrates a typical date of this class. The soft dates, on the other hand, have the skin of the ripe fruit loosened over a great part of the surface into a few large, soft blisters, and the flesh is usually thick and remains soft, or at least tender. Typical soft dates are illustrated in Plates VIII and IX, figure 2. Dates of the first type are only moderately sweet, and as they can be eaten in quantity without inconvenience they form a large part of the food of the Arabs. Some of them, like Horra and Kenta, have a delicious flavor, while others are insipid. The soft dates, on the other hand, are generally so rich and sweet as to be rather a dessert fruit than a staple article of food. To this category belong the highly prized Deglet Noor, the choice Menakher, the rich, sirupy Fteemy—in short, most of the finest varieties. While many of these can be kept for a long time in good condition, others are not preservable, but must be eaten fresh or, at most, a few weeks after they are gathered.

Under the first heading following—"Varieties of primary importance"—these are arranged as nearly as possible in the order of their value, as determined by the considerations mentioned above. Under the headings "Varieties of secondary importance" and "Varieties of minor importance" the varieties follow the order in which they are placed in the key. The "Varieties imported but not included in the key" and "Varieties included in the key but not imported" are arranged alphabetically.

VARIETIES OF PRIMARY IMPORTANCE.

SOFT DATES.

MENAKHER (p. 106).—Fruit of the soft-date type (Pl. VIII, fig. 2), 2 to 2⅔ inches long, about one-half as wide, oblong, broad and rounded at both ends, keeping its shape well when preserved; brownish maroon when ripe; the flesh 2 to 2½ lines thick; the seed broad at both ends, about one-half as long as the fruit, one-half as wide as long, very rough. (Fig. 6.)

The leaves (Pl. V) are long and broad and rather stiff and heavy, crowded with very numerous long leaflets, and their stalks are armed almost throughout their length with long, stout spines. The fruit clusters are short and dense, their stalks bright yellow (not at all orange), rather short, stout, and only moderately curved, so that the bundles do not hang down below the leaves, as in the Deglet Noor, but are almost hidden by the foliage.

This superb variety produces fruit that is thought by many of the natives, and even by some of the few Europeans who have tasted it, to surpass the Deglet Noor. In the writer's judgment and that of several of his colleagues who have given much attention to the subject of dates, as well as in the opinion of the experts attached to two of the largest American firms that import fruits, it is at least equal in quality to the Deglet Noor, which it considerably resembles in flavor. In size Menakher dates are one and one-half to nearly two times as large as the Deglet Noor.[a] In color they are generally darker. The seed, though thick, is short in proportion to the length of the fruit, and it is very different in appearance from that of the Deglet Noor. The thick, translucent flesh, although soft and sirupy at the moment of ripening, becomes firm when preserved, just as does that of the Deglet Noor. At the same time, it does not become dry and hard after a few months, as in most of the dry dates. If preserved with any care, Menakher dates keep their shape admirably. Those that were examined and tasted by the writer after having been kept for three or four months in the houses of natives showed themselves to be in all respects equal to the Deglet Noor in keeping quality. As in that variety, the

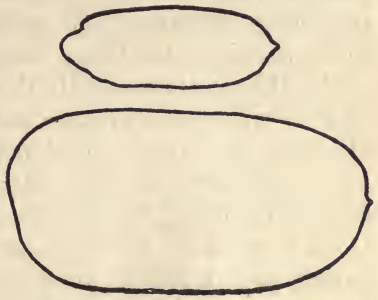

FIG. 6.—Outlines of Menakher seed and fruit. (Natural size.)

[a] Samples of Menakher and of Deglet Noor dates have recently (December 5, 1905) been received by the writer, through the kindness of Mr. Louis Grech, of Nefta, in southern Tunis. A comparison of the two shows that in volume (determined by the displacement of water) the former average 15 c. c. and the latter 9 c. c., the Menakher dates being, therefore, one and two-thirds times as large as those of the Deglet Noor variety. They are also about one and two-thirds times as heavy, Menakher fruits averaging 16.76 grams in weight, while Deglet Noor fruits average 10.44 grams. The percentage weight of the seed to that of the whole fruit (i. e., with the seed) is 10.4 in the case of the Menakher and 9.8 in the case of Deglet Noor. The importance of this character in distinguishing date varieties was first pointed out by Prof. J. W. Toumey. An exceptionally large Menakher fruit weighed 18.7 grams and the seed 1.7 grams, or only 9.1 per cent of the weight of the whole fruit.

skin does not become sticky, but remains dry and clean, which is a very desirable property in a dessert fruit.

An objectionable feature in Menakher dates is the strong development of the white, stringy core, or "rag," to borrow a term from the orange growers. This diminishes perceptibly, however, in thoroughly ripe fruit. The consensus of opinion among those who examined the two samples from Nefta mentioned in the footnote on page 61 is that in point of appearance, cleanness of skin, keeping quality, and delicacy of flavor the Menakher dates surpassed the Deglet Noor, while the latter are superior in the crisper texture of the flesh and the smaller development of stringy core. Menakher dates are generally reserved for the tables of the wealthier natives and for gifts to their friends. On the rare occasions when they are sold they are said to bring about one-third more than Deglet Noors.

The Menakher variety ripens its fruits in the latter part of October. It is said to yield little during the first few years after the offshoots are planted, but afterwards surpasses the Deglet Noor in yield, one palm producing sometimes 220 pounds of dates. Single clusters are said to be sometimes too heavy for a strong man to carry.

Menakher palms occur in the oases of Nefta, Tozer, and El Oudiane of the Jerid group, and are said also to occur in the Nefzaoua region, although the writer could not confirm the latter statement. They are everywhere, however, extremely rare, being found usually only in the largest and finest gardens, with rarely more than one individual in each garden. In the oasis of El Oudiane, where palms of this variety are said to be most frequent and to produce the finest fruit, there are probably not more than 12 or 15 trees, and most of these are old ones, no longer producing offshoots.

The natives give a curious account of the great rarity of this variety, which they hold in high esteem, and almost veneration. It appears that in former times the bey and other great dignitaries of the country were excessively fond of Menakher dates, and were in the habit of sending their agents to the Jerid at the time they ripen in order to procure them. As their fondness for these dates increased they began to appropriate the entire crop, leaving none for the unfortunate owners of the trees, and often forgetting to pay for what they took. Consequently the proprietors, in disgust, stopped planting offshoots of this variety and sometimes even went to the length of cutting down old palms.[a] Nowadays so few offshoots are left that there is some danger of the complete extinction of the variety. Even if every effort were made to reestablish it, it would require many years before Menakher dates could be produced in large quantity.

[a] The natives give the same explanation of the extreme rarity of the prized Selatny (see p. 93), the only Tunisian variety which might be considered first class of which the writer failed to procure offshoots.

Although the Arabs invariably relate the history given above in attempting to account for the passing of this choice variety, it is possible that there are other reasons for its rarity. Some of the gardeners who are familiar with it say that very careful nursing is required to make Menakher offshoots live and grow. On the other hand, Si Brahim Ben Ouedi, of Nefta, the owner of a fine young palm of this variety, says that while great care must be taken in detaching and planting Menakher offshoots, they are afterwards as easy to grow as those of other varieties.

After an exhaustive search of all the Jerid oases for Menakher offshoots only nine could be obtained for importation into the United States, of which six were so small that little hope was entertained of their living. Fortunately, they have been given every care in the cooperative date gardens of the Department of Agriculture and the Arizona and California experiment stations at Tempe, Ariz., and Mecca, Cal., and when seen by the writer in September, 1905, all of them seemed likely to grow. So even if this valuable date becomes extinct in the country of its origin, there is a fair prospect of its being continued in the United States. It should be stated that one of the finest of the offshoots was a gift to the Department of Agriculture on the part of Si Brahim Ben Ouedi, of Nefta, from the tree mentioned above and represented in Plate V, figure 1.

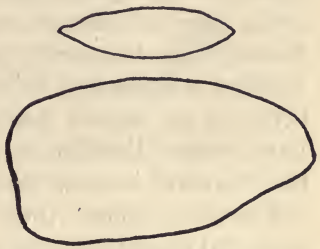

FIG. 7.—Outlines of Deglet Noor seed and fruit. (Natural size.)

DEGLET NOOR (p. 104).[a]—A soft date (Pls. I and VIII, fig. 1) 1¼ to a little over 2 inches long, and about one-half as wide, ovate oblong in shape, generally widest at or near the middle, and blunt pointed at the apex, often narrowed also at the base, maroon colored when ripe, the flesh 2 to 3 lines thick, translucent, the seed a little more than one-half as long as the fruit, conspicuously pointed, and dark chestnut-brown in color. (Fig. 7.) The stalks and branches of the fruit clusters are bright yellow (not orange), the stalks long and slender, sharply curved near the base, so that the bunches hang down far below the crown of foliage. (Pl. VI, fig. 1.) The trunk is comparatively slender. The foliage is light and delicate looking, and the narrow leaves and leaflets are rather yellowish green. The spines are slender and weak.

This well-known variety is largely exported to Europe from Algeria and Tunis, and is practically the only North African date that is known in the United States. There can be no doubt that the

[a] Described in Bul. 53, Bureau of Plant Industry, pp. 33–36.

Deglet Noor presents a combination of characters—fine flavor, sweetness, attractive appearance, cleanliness, good keeping quality—that can be rivaled by no other variety that is widely grown in Algeria and Tunis. Only among very rare sorts, such as the Menakher (see p. 60), is there any possibility of its meeting a competitor. Even in the oases themselves it is the only kind that is found on the tables of Europeans or that is served by the more wealthy natives to their European guests. The general recognition of the superior quality and the commercial importance of the Deglet Noor is shown by the fact that the "kanoon" tax levied by the Tunisian government upon date palms in full bearing amounts to $1\frac{1}{3}$ francs ($25\frac{1}{2}$ cents) for each Deglet Noor tree, and only two-thirds of a franc per tree for all other varieties.

The Deglet Noor ripens its fruit to perfection in the oases of the Jerid, and the government is attempting to establish it in the Nefzaoua region. Elsewhere in Tunis the climatic conditions are unfavorable to this variety, which is one of the latest sorts to ripen and requires a high sum total of mean temperatures above 64.4° F.[a] to bring it to perfect maturity. The maritime climate of Gabes is particularly ill adapted to the Deglet Noor, and the trials that have been made of it there have been unsuccessful.

First introduced into Tunis from the Oued Rirh, in Algeria, some 200 or 250 years ago, there are said to be now some 50,000 trees of this variety in the Jerid oases, in which case it constitutes 7 to 8 per cent of the total number of palms of all varieties.[b] The development of a very respectable export trade in Deglet Noor dates during the past ten or fifteen years[c] has stimulated the natives to plant trees of this variety, and the proportion of Deglet Noor to other palms will doubtless steadily increase from this time forward. As sufficient offshoots of this variety are not produced in their own gardens, the inhabitants of the Jerid have secured a modification of the Tunisian law against the importation of living plants,[d] thus allowing them to bring offshoots from the Oued Rirh oases in Algeria.

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[a] Estimated by W. T. Swingle (Bul. 53, Bureau of Plant Industry, p. 67) to aggregate 3,600° F.

[b] The total number of productive date palms in the Jerid in generally placed at from 600,000 to 700,000, although some authorities estimate as high as 1,000,000 trees.

[c] Estimated in 1893 to amount to 660,000 pounds, while in 1904 more than four times that quantity (2,860,000 pounds) is said to have been purchased for export—550,000 pounds by a single French firm. The annual exports of Deglet Noor dates from the ports of Tunis are said to have averaged in recent years 1,175,000 to 2,200,000 pounds, all of this quantity having been grown in the Jerid oases.

[d] Designed to prevent the introduction of phylloxera.

As to the quality of the Deglet Noor dates produced in the Jerid oases, the buyer for a well-known French importing house, who had operated during several previous years in the Oued Rirh but who last season (1904) made his purchases in the Tunis oases, was of the opinion that the latter region surpasses the Oued Rirh oases in the quality of its Deglet Noor dates. As compared with the fruits of this variety grown in the Oued Souf,[a] those of the Jerid are larger, softer, and of finer appearance, while the Deglets of the Souf are said to be superior in keeping quality.

The natives consider a sandy soil as decidedly more favorable to the quality of the Deglet Noor fruit than one containing much silt or clay.

Deglet Noor dates begin to ripen in quantity in the Jerid toward the end of October; Masselot gives October 25 as the usual date. The harvest of 1904 commenced about that date and continued throughout November, December, and the first days of January, 1905. The crop is generally purchased on the trees for about two-thirds of the price which the dates bring at wholesale at Marseille, and the buyer undertakes the gathering[b] and packing of the fruit. In 1904, when the crop was an unusually abundant one both in the Jerid and the Oued Rirh and the price correspondingly low, these dates sold on the trees for about $2.59 per 100 pounds, and brought at Marseille from $3.54 to $3.88. In 1903, when the crop was much smaller, Deglet Noor dates from the Jerid sold at Marseille for from $4.75 to $4.80 per 100 pounds. The season of 1904 was unusually favorable to the quality as well as the yield, less than 0.3 inch of rain having fallen at Tozer during the months of September and October together, and only 0.2 inch during November.

The Deglet Noor is slower in coming into full bearing than most other varieties, the palms generally not giving a good crop until they are ten years old, while the Fteemy variety begins to yield largely when only four or five years old. The fruit of very young trees is said to be usually inferior in quality. While some varieties bear well every year, a Deglet Noor palm produces largely only every second or third year, and the average crop is smaller than that of many less esteemed kinds. The average yield in the Jerid of Deglet Noor palms in full bearing is stated by one authority to be 132 pounds,[c] while

[a] See Bul. 86, Bureau of Plant Industry, p. 24.

[b] See p. 52 for an account of the methods of harvesting.

[c] In Algeria the average product of this variety is variously estimated to be from 88 to 132 pounds. (See Bul. 53, Bureau of Plant Industry, p. 35.) On account of its relatively low productiveness and its delicacy of constitution, the inhabitants of the Mzab oases are somewhat prejudiced against this variety, notwithstanding the undeniable excellence of its fruit. But, being largely

for the Fteemy and Kenta varieties 200 and 300 pounds, respectively, are not considered extraordinary yields.

Opinions differ in the Jerid as to the degree of resistance of this variety to large amounts of salts in the soil. The proprietor of one garden at Tozer, in a part of the oasis where there is much saline efflorescence, regarded the Deglet Noor as the most susceptible of all varieties to the effect of "alkali," while at El Hamma experts in date culture told the writer that, if freely irrigated, this variety shows a high degree of resistance.

Boo Affar (p. 101).—A soft date (Pl. IX, fig. 2), about 2 inches long and from a little more than one-half to three-fifths as wide, conspicuously wider above than below the middle but narrowed to the blunt apex, bright purplish maroon when ripe, the flesh 3 to 3½ lines thick, tender yet firm, the seed a little more than one-half as long as the fruit, cinnamon brown. (Fig. 8.) The stalks and branches of the fruit clusters are deep orange. The foliage is said to be heavy and the leaves wide and very green.

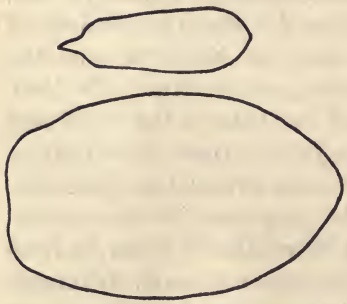

Fig. 8.—Outlines of Boo Affar seed and fruit. (Natural size.)

This variety occurs in the gardens of El Hamma oasis (Jerid) and in the Nefzaoua, but is nowhere common. The fruit is remarkable not only for its large size, thick flesh, and delicious flavor, but for its beautiful coloring, its tints rivaling those of scarlet oak leaves in the autumn. The fruit ripens rather late (in November, according to Masselot). It resembles that of the Areshty variety (see p. 70), but is much more highly colored. It is said to be better flavored than the Areshty when thoroughly ripe, and in the writer's opinion this is true. On the other hand, the natives prefer the fruit of Areshty to those of Boo Affar when only partly ripe. The flesh is tender, yet rather firm, and is very sweet and full of sugar. The skin, even of the ripe fruit, is fairly clean and dry. Of this variety 8 offshoots were imported.

Tronja (p. 99).—(Also spelled Troundja.) A soft date (Pl. IX, fig. 1), perfectly round, or nearly so, 1½ to nearly 2 inches in greatest diameter, maroon to prune purple when ripe, the flesh 4 to 5 lines thick, very sugary, yet firm; the seed very thick, six-tenths to seven-tenths as long as the fruit and about three-fifths as long as wide,

engaged in other business, they are not so dependent for a livelihood upon the product of their date palms as are the natives of other Saharan oases, else they would probably attach greater importance to the commercial superiority of the Deglet Noor. (See Charlet, in Bul. Soc. Géogr. d'Alger, 1905.)

much furrowed. The foliage (Pl. IV, fig. 1) is dense, the leaves wide, crowded with leaflets, and drooping gracefully at the ends.

This is a rare variety, apparently confined to Tunis, occurring sparingly in the Jerid and the Nefzaoua. The fruit, which ripens in October, is remarkable for its large size, the thickness of its flesh, and its globular shape. The short, very thick seed is also characteristic. (Fig. 9.)

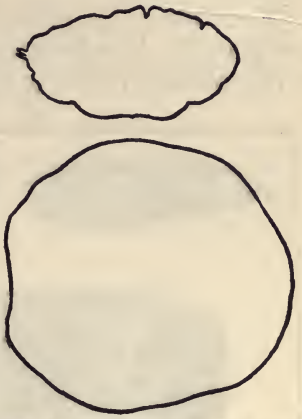

FIG. 9.—Outlines of Tronja seed and fruit. (Natural size.)

This date is highly esteemed by the natives. The flesh is very firm and even somewhat tough, extremely sweet, and very rich flavored, the flavor suggesting that of the Fteemy. Tronja dates can not be eaten in large quantity, as their richness soon cloys, but as a dessert fruit they are very promising. They ripen in October. Of this variety 8 offshoots were imported.

Boo FAGOOS (p. 101).—The name (in French orthography, Bou Fagous, or Feggouss) signifies "father of the cucumber." A soft date, $1\frac{2}{3}$ to $1\frac{7}{8}$ inches long, considerably more than one-half as wide, constricted near the middle and widest toward the apex, maroon to prune purple when ripe, the flesh $2\frac{1}{2}$ lines thick, the seed from a little more than one-half to five-eighths as long as the fruit, rather slender. (Fig. 10.) The orange-colored stalks of the fruit clusters are sharply curved and so short that the rather small bunches hardly extend beyond the leafstalks. The foliage of this, as of several other of the finest varieties, is of a light and delicate aspect, due in this case to the relatively few leaves and the narrowness of the leaflets. The leaves themselves are large and wide. As in the Deglet Noor, they curve downward very noticeably. In color they are an unusually rich green. The spines of the leafstalks are few and weak. The offshoots remain small while attached to the parent tree, and the Arabs advise that greater care be taken to keep them moist after removal and before planting than is necessary with most other varieties.

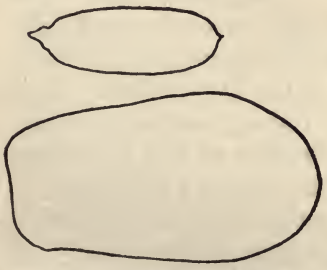

FIG. 10.—Outlines of Boo Fagoos seed and fruit. (Natural size.)

The variety is rather common, but nowhere abundant, in the oases of the Jerid, to which it appears to be confined in Tunis, although said to occur also in the Mzab oases of Algeria. It is in high repute among the natives, being exported to all parts of Tunis and Al-

geria. The large fruit is remarkable for its unusual shape, somewhat like that of some varieties of gherkins, to which it doubtless owes its Arabic name. The flesh is thick and rather firm, yet tender. It is very sweet and has a very distinctive and highly attractive flavor. It ripens late in October. Of Boo Fagoos offshoots 16 were imported.

TAFAZWEEN (p. 101).—(Name spelled by French writers "Tafazaouine.") A soft date, 2 to 2⅛ inches long, about two-fifths as wide, oblong, tapering slightly from base to apex, bright bay colored when ripe, the skin conspicuously marked with short linear scars, the flesh 1½ to 2 lines thick, the slender seed about three-fifths as long as the fruit. (Fig. 11.)

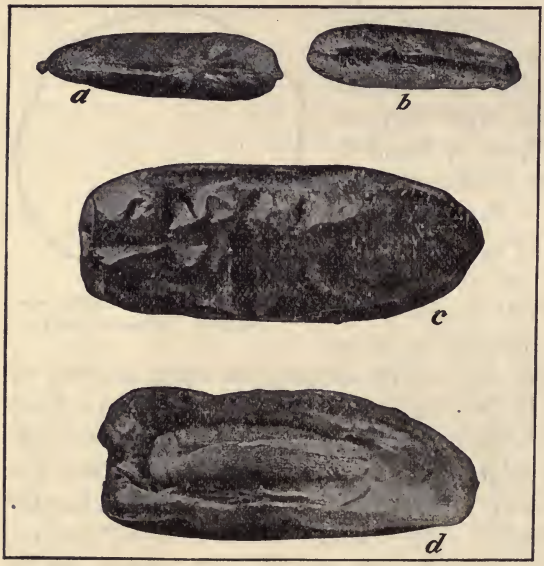

FIG. 11.—Tafazween seeds and fruits. (Natural size.)

This variety is common in the Oued Souf, in Algeria, where it is considered one of the best dates of the region.[a] It is also found in the Mzab and Oued Rirh oases of Algeria. In the Jerid, where the name is pronounced "Tafazweent," it is extremely rare. The handsome fruit is easily recognized by its long, narrow shape, bright bay color, and curiously marked skin. It is said to ripen in October. The flesh is soft and translucent, like that of the Deglet Noor. It is very sweet and of excellent flavor, in this respect somewhat resembling Lagoo, but superior. Twenty-one offshoots of this promising variety were imported, of which only one was obtained in Tunis.

FTEEMY (p. 106).—(Name spelled by French authorities "Ftimi.") A soft date (Pl. X, fig. 3), 1⅜ to 2 inches long, about one-half as wide, oblong, slightly narrowed at both ends, dark purplish maroon when ripe, the surface shining, the flesh soft and sirupy, about 2 lines thick, the seed a little more than one-half as long as the fruit, slender. (Fig. 12.)

[a] See Bul. 86, Bureau of Plant Industry, p. 26.

The foliage of this variety (Pl. VII) is luxuriant and the numerous leaves are long, wide, and crowded with long, broad leaflets. In color they are decidedly bluish, owing to the presence of a heavy white bloom. When this is rubbed off, a rich, deep grass-green color appears. The spines are stout and green. The deep orange-colored stalks of the fruit clusters are shorter, much stouter, and much less bent than in the Deglet Noor, so that the bunches do not hang down below the crown of foliage, as in that variety. The clusters themselves are shorter and more crowded with fruit.

This is by far the most abundant variety in the Jerid oases, comprising probably at least one-third of all the date palms in that region. The best fruit of this variety is said to be produced in the oasis of Kriz (El Oudiane). In the Nefzaoua it is not abundant, and in the oases near the coast it is of relatively small importance. In the oases of eastern Algeria, although geographically so near the Jerid and in such close communication with the latter region, this variety seems to be little known, although at Ourlana, in the Oued Rirh, it is said to occur under the name of "Bou Aroussa" (father of the bride). After the Deglet Noor, Fteemy is the variety most generally esteemed among the natives of the Jerid. Its great importance is shown by the fact that it is apparently the only variety of which the fruits are differently designated, according to whether they are in the bunch (halig) or detached (mantoor). It is largely exported to other parts of Tunis and Algeria and even, it is said, to Europe (probably to Italy). It is one of the kinds that is most sought after by the nomadic Arabs who barter the grain they raise in the plateau region for the dates of the Jerid.

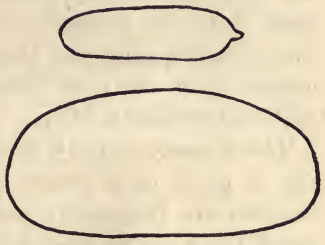

FIG. 12.—Outlines of Fteemy seed and fruit. (Natural size.)

Although inferior in flavor to the Deglet Noor, the Fteemy is unquestionably an excellent variety, greatly excelling the Deglet Noor in vigor, rapid growth,[a] early productiveness, and large yields. The oblong fruit when ripe is of a fine reddish-purple color, which contrasts strikingly with the deep orange branches of the clusters. It is very rich in flavor, extremely sweet, and so soft and sirupy as to melt in the mouth when fresh. It can not be eaten in great

[a] Mr. Bernard G. Johnson, who is stationed at the cooperative date garden of the Bureau of Plant Industry and the California experiment station at Mecca, Cal., reported in October, 1905, that among the offshoots from Tunis planted there in May of the same year, those of the Fteemy variety were showing signs of growth in larger proportion than those of any other kind.

quantity, however, without cloying. A further disadvantage is that owing to the excess of sirup it contains, it becomes very sticky, and is therefore less satisfactory as a dessert fruit than the Deglet Noor. It is said to be easily preserved, and the Fteemy was enumerated at Kebili among the seven best-keeping sorts. Fteemy dates sold at Tozer in 1904 for about $1 per hundred pounds on the tree, which was about two-fifths of the price then being paid for Deglet Noor dates. The offshoots are cheaper than those of the Deglet Noor, 48 cents being the average price of a good offshoot.

The offshoots of this variety are frequently allowed to grow up around the parent stem, so that at length it is often hard to distinguish the original trunk. This is never permitted in the case of the Deglet Noor, the offshoots of that variety being always removed for planting while still quite small.

The habit of blossoming a second time, generally in July, is more characteristic of this than of any other Tunisian variety. The second-crop dates, being unpollinated, are seedless and remain small and green. In the autumn it is not uncommon to see large clusters of them overtopping the bunches of highly colored ripe dates. They remain upon the trees throughout the winter, and are said to become soft and edible in May.

The Fteemy variety is considered one of the most productive, giving a good crop every year. Trees bearing 15 to 20 well-filled clusters are frequently seen, and 200 pounds is by no means an unusual yield. The trees begin to bear a considerable amount of fruit when only five years old, so that this variety comes into bearing about twice as rapidly as the Deglet Noor.

Fteemy is a late-ripening variety, its fruit beginning to mature in quantity at the same time as the Deglet Noor (about October 20). As the dates can be left on the trees a long time after they are ripe without deterioration, unless much rain falls, the harvest of this variety is generally postponed until after that of the Deglet Noor. Fteemy dates are generally the last to be gathered, often remaining on the palms until the end of January.

In respect to ability to withstand "alkali" in the soil, the proprietor of a garden in the saline part of the oasis of Tozer told the writer that he considers this the most resistant variety, more so even than Kenteeshy. At Nefta the amins and other agricultural experts ranked it among the four most alkali-resistant varieties of the oasis. At El Hamma also it is regarded as one of the three or four most resistant kinds, provided it is abundantly irrigated. Of this variety 25 offshoots were imported.

Areshty (p. 101).—(Name spelled Arichti by French writers.) A soft date, 1⅜ to 2½ inches long, one-half to two-thirds as wide, slightly

larger above than below the middle, broad and rounded at the apex, light bay or hazel brown when ripe, the flesh 2½ to 3 lines thick, firm but tender, the seed about one-half as long as the fruit, rather thick, irregularly roughened. (Fig. 13.) The stalks and branches of the fruit clusters are pale orange. The foliage of this variety is rather light, and the leaves droop somewhat as in Deglet Noor palms. The Arabs say that the foliage of the Areshty is greener than that of the Deglet Noor. The leaflets are long, narrow, and rather sparse. The spines on the leafstalks are comparatively few, slender, and weak. The trunk is stout.

Frequent in the oases of the Jerid, the Nefzaoua, and Gabes, but nowhere abundant in Tunis. At Gabes the fruits are smaller and duller colored than in the Jerid, and are said not to preserve well. It occurs also in Algeria, at Biskra, and in the Oued Rirh. This is one of the largest dates grown in Tunis. The fruit is generally egg-shaped. It ripens about the middle of October, but is considered by the natives to be at its best before it is perfectly mature, although to an American palate it would doubtless be preferable when ripe. The flavor of the thoroughly ripe fruit is agreeable, although not very remarkable. While not as rich and sweet as the Boo Affar (see p. 66), it is wholesome, nut-like, and not easily cloying. The flesh becomes quite firm and the ripe fruit keeps its shape well when preserved. Thirteen Areshty offshoots were imported.

FIG. 13.—Outlines of Areshty seed and fruit. (Natural size.)

DRY DATES.

HORRA (p. 98).—The name is also spelled Hourra, Harra, and Herra, and means "pure" or "noble." A dry date (Pl. X, fig. 1), about 2 inches long, about one-half as wide, ovate, narrowed from the base to the rounded apex, rather dull purplish maroon when ripe, the flesh 2 to 2½ lines thick, with its white central zone much thicker than the dark outer portion, the seed usually about one-half as long as the fruit. (Fig. 14.) The stalks and branches of the fruit clusters are orange yellow. The leaves are large, with very numerous slender leaflets.

This variety, which also occurs in Algeria—at Biskra and in the Oued Rirh—is frequent in the Jerid and abundant in the Nefzaoua, where, the Deglet Noor not being grown, it is generally esteemed as the finest variety. At Gabes there are a few trees, but the variety

does not thrive well so near the sea. The fruit is the largest and finest produced by any variety of the dry date class. This, indeed, can be regarded as a connecting link between the dry dates and some of the firm-fleshed type of soft dates (Khalt Horraowia, Khalt Mooashem, etc.). Horra dates ripen in September and October. The flesh becomes quite solid in the ripe fruit, but is never extremely hard and dry. It has the characteristic nutty flavor of the dry dates, but is much richer than most of them. It is at its best only when perfectly mature. Europeans who are acquainted with this date praise it highly. Du Paty de Clam[a] pronounces it a "rival of the Deglet [Noor]." The commandant of the French garrison at Kebili likes it better than the Deglet Noor, and gives it the preference over all other varieties for planting in his garden. Not only is it highly esteemed by the natives, but it is said to be exported to Europe and even to France. The caid of Kebili ranks it among the seven best-keeping varieties of the Nefzaoua. It is a medium early sort, ripening in the latter part of October. The palms have not a very vigorous look, yet they appear to be resistant to alkali in the soil and to thrive with less irrigation than such varieties as Deglet Noor and Fteemy. Forty-eight offshoots of this variety were imported. Nearly all of these were obtained in the Nefzaoua, as in the Jerid offshoots are scarce and the natives are reluctant to part with them.

FIG. 14.—Outlines of Horra seed and fruit. (Natural size.)

KENTA (p. 97).—A date of the dry type (Pl. X, fig. 2), $1\frac{1}{3}$ to $1\frac{2}{3}$ inches long, about one-half as wide, narrowed from the middle or above it to the broad apex, dull bay colored when ripe, much of the skin loosened in large blisters in the ripe fruit, the flesh $1\frac{1}{2}$ to 2 lines thick, the seed somewhat more than one-half as long as the fruit, rounded at both ends, light brown. (Fig. 15.) The leaves of this variety are rather broad, with numerous long, narrow leaflets. The long leafstalks are spiny only near the base. The light orange stalks of the fruit clusters are stout and horizontal or ascending, and so short that with the bunches they do not equal the leafstalks. The clusters themselves are short, thick, and densely crowded with fruit.

This is one of the most highly esteemed and most widely grown of the dry dates found in Tunis, and is said also to occur in Algeria. While abundant in the Jerid, it is relatively much more important

[a] Etude sur le Djérid, Bul. Géogr. Hist. et Descr., No. 3 (1893). Separate, issued in 1894, p. 12.

in the Nefzaoua. One-fourth of the palms in the oasis of Kebili are said to be of this variety, and the French commandant there has selected it, together with Horra (see p. 71), for planting in his garden. It is also very important at Gabes, where it is ranked among the six best kinds of the region. The fruit is of medium size and, as indicated in the key (p. 97), is remarkable among the dry dates for the manner in which the skin becomes loosened into large blisters, which is usually a peculiarity of the soft dates rather than of the dry dates. The flesh is rather thin and becomes quite firm, although not very dry, in the perfectly ripe fruit. The surface is clean and dry, even when the fruit is quite ripe. It is not sirupy, although pleasantly sweet, and can be eaten in quantity without cloying. The flavor is very agreeable, wholesome, and of the nutty quality characteristic of most dry dates. Dates of this type, if extensively grown in this country, might become an important element in the diet of those who prefer vegetable to animal food.[a] Fruit of this variety is said to sell on the trees at $1.12 to $1.20 per hundred pounds, a little less than one-half the selling price of Deglet Noor dates.

FIG. 15.—Outlines of Kenta seed and fruit. (Natural size.)

The Kenta date is one of the best in keeping quality of the dry dates, retaining its shape perfectly and never becoming extremely hard, as do most of that class. At Gabes it is preserved in earthenware jars, and is said by the amins (agricultural experts) to be one of the two best keeping sorts of the region. One of the amins, wishing to emphasize its importance as a staple article of food, likened it to wheat or barley and the soft dates to confectionery. The caid of Kebili cited it among the seven best-keeping varieties. It is an important article of commerce between the inhabitants of the oases and the natives of other parts of Tunis and Algeria, and is said even to be exported from the Nefzaoua to Europe (probably to Italy).

Kenta is a comparatively early ripening variety, maturing in the Jerid about the middle of October and perhaps earlier. Its fruits, like those of others of its type (e. g., Angoo and Remta), are said to be less liable than the soft dates to be spoiled if rain falls upon them when in the ripening stage. At Gabes it is regarded as one of the two most productive varieties. It is said to give an abundant crop every year. In the Jerid many trees are pointed out as yielding 330 pounds of fruit. M. Minangoin mentions a tree at El Oudiane that is said to produce 770 pounds, and also trees at Kebili at least 200 years old that still yield 265 pounds of fruit annually.

[a] As suggested by Mr. O. F. Cook. See Bul. 53, Bureau of Plant Industry, p. 31.

In the Jerid, Kenta is said to be the most salt-resistant variety in high-lying, well-drained land. At Gabes, on the other hand, it is cited as the only variety that is not salt resistant; but this may be because most of the saline land of the oases is low and badly drained.

Forty-three offshoots of this variety were imported, the great majority of which were obtained in the Nefzaoua oases.

VARIETIES OF SECONDARY IMPORTANCE.

DRY DATES.

Angoo (p. 97).—Fruit barely 1 inch long, about seven-tenths as wide, sometimes broadest below, sometimes above the middle, bright bay colored when ripe, much of the skin becoming loosened in large blisters, the flesh a little more than 1 line thick, becoming firm and dry, the white central portion thicker than the dark-colored outer zone, the seed about two-thirds as long as the fruit, about one-half as wide as long, light (drab) brown. (Fig. 16.) The stalks of the fruit clusters are lemon yellow (not orange). The branches of the clusters are very densely crowded with the small fruits, which hang on persistently after ripening instead of becoming easily detached.

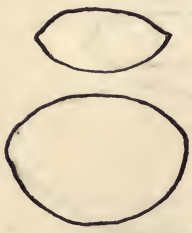

Fig. 16.—Outlines of Angoo seed and fruit. (Natural size.)

This, the smallest fruited of the Tunisian varieties, is found apparently only in the Jerid, and is best known as El Hamma. It appears to be nowhere common. Despite its diminutive size and thin flesh, this little date is one of the most attractive of the dry type. Because of its moderately sweet, nutty, wholesome flavor it can be eaten in large quantity without cloying, and should be a healthful food. Like Kenta (see p. 72), it is exceptional among the dry dates, because its skin becomes loosened into blisters over much of the surface of the fruit. The fruits are said to be little injured by autumn rains. They ripen in midautumn, keep well, and are much sought by the nomads of other parts of Tunis and Algeria. Of this variety ten offshoots were imported.

Thaby (p. 98).—The name, which means "golden," is also written "Dzhabi," and is sometimes pronounced as if spelled Derby.[a] Fruit 1⅔ inches or slightly longer, about one-half as wide, oblong, often slightly constricted a little above the base, somewhat pointed at apex, bright reddish brown when ripe; the flesh 1 to 1½ lines thick, rather tough, the dark-colored outer zone apparently much thicker

[a] A variety called El Darbia, described as having a "green, dry fruit of medium size," occurs in Algeria.

than the white inner portion; seed about three-fifths as long as the fruit, rather slender. (Fig. 17.) The stalks and branches of the fruit clusters are rich orange colored.

This variety appears to be confined to the Jerid, and to be by no means common there. It is one of the handsomest of the dry dates, and one of the most attractive when preserved, keeping perfectly its shape and its beautiful warm, reddish brown color. Unlike most of the dry dates, in this variety the comparatively soft and dark part of the flesh is thicker than the firm, white core. It has an agreeable, wholesome flavor, and can be eaten in quantity without cloying It matures in October. Of the Thaby variety, fifteen offshoots were imported.

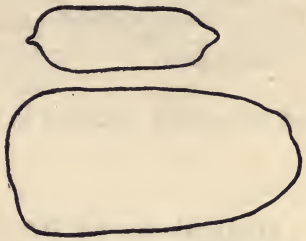

FIG. 17.—Outlines of Thaby seed and fruit. (Natural size.)

LEMSY (p. 99). Fruit 1½ to 1⅔ inches long, about one-half as wide, elliptical in outline, not conspicuously narrowed to the apex, often slightly curved, dull purplish maroon when ripe; the flesh 1 to 2 lines thick, becoming very firm and dry; the seed about two-thirds as long as the fruit, generally one-third as wide as long. (Fig. 18.) The branches of the fruit clusters are orange colored.

This variety is said to be known in the Nefzaoua as Halooa Hamra. It is common at Gabes and in the Nefzaoua, but is apparently wanting in the Jerid. It is a small, thin-fleshed, dry date, sometimes preserved, but usually eaten fresh and even before it is perfectly ripe, as the flesh soon becomes dry and hard. It is deliciously sweet and has a fine flavor, tasting somewhat like a chestnut. At Gabes, where it is regarded as a great delicacy, it is said to mature at the end of August, at the same time as Ammary (see p. 87). Of Lemsy two offshoots were imported.

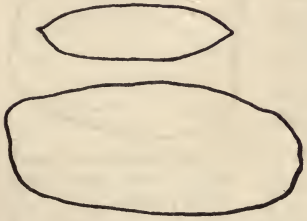

FIG. 18.—Outlines of Lemsy seed and fruit. (Natural size.)

HALOOA BAYDA (p. 99).—Also spelled "Halouaia," which designates the palm, "Halooa" referring to the fruit itself. The name means "white sweetmeat." Fruit 1⅓ to 1½ inches long, about one-half wide, elliptical in outline, not conspicuously narrowed at the apex, widest near the middle, dull purplish bay when ripe; the flesh 1 to 1½ lines thick, becoming very firm and dry; the seed about seven-tenths as long as the fruit and one-third to two-fifths as wide as long. (Fig. 19.) The branches of the fruit clusters are pale orange.

This variety, which is not common in the Jerid, abounds in the Nefzaoua. The Halooa of the Algerian oases appears to be distinct (see p. 99). It is much like the Lemsy (see p. 75), but the fruit is even smaller. It ripens rather early (October 10, according to Masselot), and is generally eaten fresh, becoming hard and dry when preserved. Because of their simple, wholesome flavor and not excessive sweetness, the writer found it possible to eat dates such as Lemsy and Halooa Bayda much more freely than the rich, sirupy kinds. Offshoots of this variety to the number of 24, mostly obtained in the Nefzaoua, were imported.

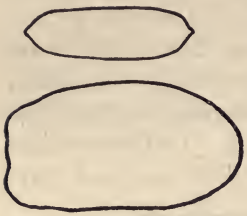

FIG. 19.—Outlines of Halooa Bayda seed and fruit. (Natural size.)

SOFT DATES.

MOKH BEGRY (p. 100).—French orthography, Moukh Begri. The name signifies "the brain of an ox." Fruit (Pl. X, fig. 4) 1⅜ to 1½ inches long, about three-fourths as wide, broadest at the base and narrowed thence to the broad rounded apex, flattened on the sides, bright bay colored when ripe; the flesh very soft, about 1½ lines thick, rather dark colored, translucent; the seed light brown, one-half to two-thirds as long as the fruit, about twice as long as wide, rounded at both ends. (Fig. 20.) The stalks and branches of the fruit clusters are light orange.

FIG. 20.—Outlines of Mokh Begry seed and fruit. (Natural size.)

This is an extremely rare and much esteemed variety, apparently occuring only in the Jerid oases. The trees are said not to bear heavily. The dates are rather small and have an unusual shape. The translucent flesh is very soft, but the fruit is said to preserve well. It is very sweet and of delicious flavor, resembling and perhaps equaling the Deglet Noor. The fruits ripen in the latter part of October. After a thorough search only two offshoots could be procured for importation.

BAYDH HAMMAM (p. 100).—The name means "pigeon egg." Fruit 1⅝ to 1¾ inches long, three-eights to five-eighths as wide, egg-shaped, broadest near the middle, rather conspicuously blunt pointed at apex, not keeping its shape well, dark chestnut brown with a tinge of maroon when ripe; the flesh very soft and dark colored, about 2 lines thick; the seed one-half to five-eighths as long as the fruit, one-third to two-fifths as wide as long, dark brown. (Fig. 21.) The stalks and branches of the fruit clusters are orange colored. The

foliage is of a rather delicate aspect and the leaves numerous, the leaflets long, narrow, and rather sparse.

This is a handsome dark-brown date, with very soft dark-colored flesh. It is always eaten fresh, not being conservable. It is exceedingly sweet. The flavor of the perfectly ripe fruit is agreeable and very characteristic, resembling that of Tozer Zaid Safra (see p. 85). To the writer's taste, however, it is far less attractive than that of the Deglet Noor type or even of the dry dates, and it very soon cloys. The natives esteem it highly, as is shown by the fact that in harvesting the Baydh Hammam the clusters are carefully passed from hand to hand down the trunk, instead of being dropped to the ground by the man who cuts them. The Baydh Hammam is common in the Jerid, and is said to occur also in the Nefzaoua, as well as in Algeria (Biskra and Oued Rirh). It ripens rather late, hardly before November. Of this variety 20 offshoots were imported, all from the Jerid.

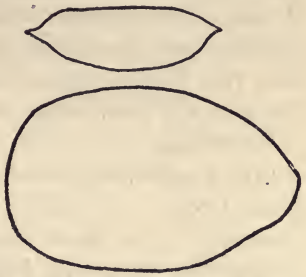

FIG. 21.—Outlines of Baydh Hammam seed and fruit. (Natural size.)

KSEBA (p. 100).—(Kessebi is probably another spelling of the same name.) Fruit about 1½ inches long, two-thirds as wide, ovate or oblong ovate, widest below the middle, purplish maroon or bay when ripe; the flesh 2 to 2½ lines thick, firm yet tender; the seed very nearly two-thirds as long as the fruit, two-fifths as wide as long, russet brown. (Fig. 22.) The branches of the fruit clusters are deep orange. The foliage is characterized by having few spines, and these are slender and weak.

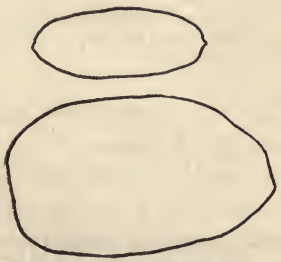

FIG. 22.—Outlines of Kseba seed and fruit. (Natural size.)

This variety is rare in the Jerid, but in the Nefzaoua, at Gabes, and at Gafsa it is one of the most important sorts. A date of the same name, described as a soft date, and possibly identical, occurs in the Oued Rirh oases of Algeria. The fruit, which preserves well, is very sweet and well flavored, in the latter respect being intermediate between Horra and Lagoo (see pp. 71 and 80). The Kseba variety, which ripens easily at Gafsa (see p. 20), may be found valuable for regions where the temperatures are not sufficiently high to mature the Deglet Noor and other choice sorts. Its fruits ripen in October. Offshoots to the number of 15 were imported.

DOONGA (p. 101).—Sometimes spelled "Denanga."[a] Fruit a little more than 1½ inches long, six-tenths to seven-tenths as wide, egg-

[a] The "Dengui" variety found at Gabes is a different date.

shaped, broadest near the base, dull dark purplish maroon when ripe; the flesh 1½ to 2 lines thick, the firm white central portion nearly as thick as the soft, dark outer zone; seed small and thick, only about one-half as long as the fruit and about one-half as wide as long, narrowed at both ends. (Fig. 23.) The stalks and branches of the fruit clusters are light orange.

This variety, which is one of the most highly esteemed and frequently planted in the Nefzaoua, does not appear to be found in the Jerid. It is a dark-colored, rather small date, with moderately soft, dark-colored flesh, and with a clean, dry skin. It is very sweet and of a fine flavor, suggesting that of the Deglet Noor. The number of Doonga offshoots imported was 10, all from the Nefzaoua.

Besser Haloo (p. 101).—Also spelled "Bisra Haloua." The name means a sweetmeat (haloo) that is eaten just before it is thoroughly ripe (besser). Fruit 1⅓ to 1½ inches long, about two-thirds as wide, broadest at or above the middle, rounded at the apex, keeping its shape well when ripe, bright bay colored; the flesh 2 lines thick, comparatively dry when the fruit is ripe, light brown; the seed two-thirds to three-fourths as long as the fruit generally two-fifths as wide as long, with more or less conspicuous wing-like ridges on the sides. (Fig. 24.) The leaves are short and rather stiff, with comparatively short stalks and wide leaflets. The spreading or ascending stalks of the fruit clusters are so short that the small bunches are nearly hidden by the foliage.

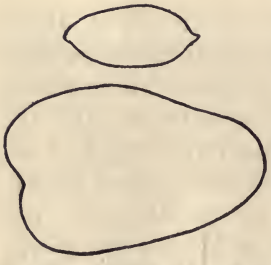

Fig. 23.—Outlines of Doonga seed and fruit. (Natural size.)

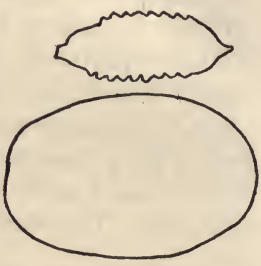

Fig. 24.—Outlines of Besser Haloo seed and fruit. (Natural size.)

This is a common and highly esteemed variety in the Jerid, and is said to be found also in the Nefzaoua, as well as at Biskra and in the Oued Rirh, in Algeria. It is one of the kinds that is most sought by the nomads of the interior, who come to the oases in the autumn to exchange their grain for dates. It is a small, light-colored date, with thick, comparatively firm flesh. It is very sweet and has an agreeable flavor, somewhat intermediate between that of Lagoo (p. 80) and that of Horra (p. 71). The natives seem to prefer it when not perfectly ripe. It matures early in October. According to information obtained by M. Minangoin, it yields a good crop every year and is one of the six most productive varieties of the Jerid. At Nefta the amins (see p. 32) rank it among the four most salt-resistant varieties

of the oasis. Of this variety 18 offshoots were imported, all from the Jerid.

Okht Fteemy (p. 102).—The French orthography is Oukht Ftimi. The name means "sister of Fteemy," this variety greatly resembling Fteemy in its trunk and foliage characters, as well as in its fruits. Fruit 2 to 2⅛ inches long, about two-fifths as wide, oblong, straight, somewhat pointed at the apex, deep purplish maroon when ripe, the surface shining; the flesh 2½ to 3 lines thick, soft; the seed slender, about one-half as long as the fruit, less than one-third as wide as long, dark brown. (Fig. 25.) The stalks and branches of the fruit clusters are rich orange. The numerous leaves are long and broad, crowded with long leaflets. The many fruit clusters are short-stalked and almost hidden by the foliage.

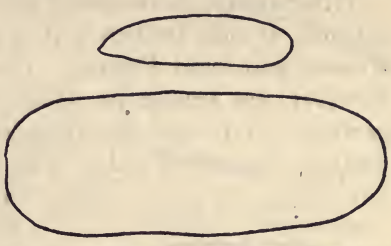

Fig. 25.—Outlines of Okht Fteemy seed and fruit. (Natural size.)

This variety appears to be confined to the Jerid, being especially abundant at Nefta, where it is preferred to Fteemy, while at Tozer the latter is better liked. The very handsome fruit is longer and more slender than that of Fteemy (p. 68), and is often brighter colored, but is otherwise very similar. In regard to flavor, the writer could detect no difference. Although very soft and sirupy, the fruits preserve well, Okht Fteemy being enumerated by one authority among the seven best-keeping sorts. The fruits are said to be the kind most in demand by the nomads from other parts of North Africa who obtain their supply of dates in the Jerid, and who exchange 4 measures (about 2½ pecks) of wheat for 9 measures (about 5½ pecks) of dates of this variety.

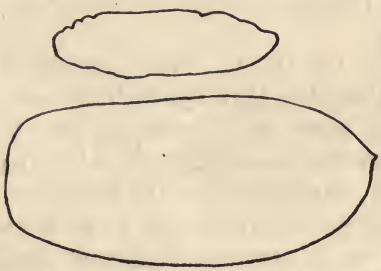

Fig. 26.—Outlines of Rhars seed and fruit. (Natural size.)

Okht Fteemy palms give a good crop every year and are very productive, this being among the six best-yielding varieties in the Jerid, according to M. Minangoin. A tree at Nefta, by no means exceptionally productive, which had 15 well-furnished clusters of fruit, was estimated by the tenant of the garden in which it grew to bear at least 220 pounds of fruit. These dates are not generally ripe before November. The amins of Nefta place this among the four most alkali-resistant varieties of the oasis. Offshoots to the number of 21 were imported.

RHARS (p. 102).—Also known as Rhars (or Ghars or Gheress) Mettigui. Fruit 1⅞ to over 2 inches long, two-fifths to nearly one-half as wide, oblong or inversely egg-shaped, bay colored when ripe, the surface somewhat shining; the flesh 2 to 4 lines thick, very soft; the slender seed about three-fifths as long as the fruit, not more than one-third as wide as long, broad and rounded at both ends. (Fig. 26.) The ripe fruit does not keep its shape well when preserved. The stalks and branches of the fruit clusters are bright orange. The trunk is stout and the foliage luxuriant, the numerous long leaves being crowded with long, broad leaflets.

This variety, so abundant and so important in the oases of eastern Algeria, is rare in Tunis, its place being taken by varieties such as Fteemy and Okht Fteemy. (See pp. 68 and 79.) While the latter, however, are among the latest ripening kinds, Rhars is one of the earliest. It is said by Masselot to begin to ripen in the Jerid as early as the end of July. The fruit is large, bay colored when ripe, with [illegible] irupy, translucent flesh, very sweet and rich flavored. Although not one of the best-keeping sorts, it is preserved by natives in skins for use during the winter. No offshoots of this variety were imported from Tunis, as the Department of Agriculture had previously introduced large numbers from Algeria.

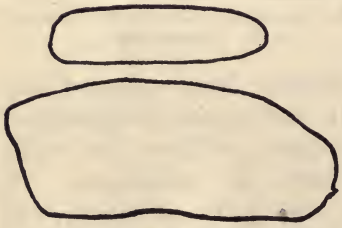

FIG. 27.—Outlines of Lagoo seed and fruit. (Natural size.)

LAGOO (p. 102).—Fruit nearly 2 inches long, less than one-half as wide, oblong, tapering slightly to the apex, more or less curved, bay to light maroon colored when ripe, the surface somewhat shining; the flesh about 2 lines thick, rather tough, dark colored; the seed slender, three-fifths to two-thirds as long as the fruit, not more than one-third as wide as long, russet brown, its surface roughened with fine wrinkles. (Fig. 27.) The stalks and branches of the fruit clusters are orange colored. The crown of foliage is rather small, the leaves short and rather stiff, with long, rather wide leaflets. The short, densely crowded fruit clusters do not equal the leafstalks. (Pl. VI, fig. 2.)

This variety is apparently confined to the Jerid oases, where it is fairly common and is highly esteemed by the natives. It is one of the earliest kinds, being said to ripen by the middle of September, and even (according to Masselot) in August. The fruit is of medium length, narrow, and is dark colored when ripe. The flesh is rather thin, but soft, very sweet, and of an agreeable, characteristic flavor, somewhat resembling the Rhars variety. It keeps well

and is exported throughout Tunis and Algeria. Of this variety 23 offshoots were imported.

ZEKRY (p. 103).—Also spelled "Zechri." Fruit 1½ to nearly 1⅔ inches long, about one-half as wide, inversely egg-shaped, keeping its shape fairly well when preserved, bay to maroon when ripe; the flesh about 1½ lines thick, moderately soft; the seed between one-half and two-thirds as long as the fruit, about two-fifths as wide as long. (Fig. 28.) The stalks and branches of the fruit clusters are orange colored.

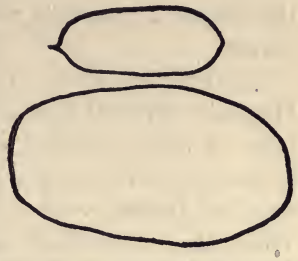

FIG. 28.—Outlines of Zekry seed and fruit. (Natural size.)

This variety, infrequent in the Jerid, is common in the Nefzaoua, where it is in high repute. When perfectly ripe the flesh, although rather thin, is soft and very sweet. The flavor is characteristic, suggesting both chestnuts and persimmons. The palms are said to yield heavily. Of this interesting variety 11 offshoots were imported, all from the Nefzaoua.

KHALT MOOASHEM (p. 104).—The name means "tattooed Khalt."[a] Fruit 1⅔ to nearly 2 inches long; about one-half as wide, egg-shaped, narrowed from about the middle to the rounded apex, keeping its shape perfectly when preserved, dark prune purple when ripe, the skin mostly adhering very closely to the flesh, conspicuously marked with transverse and longitudinal scars (hence the name); the flesh about 2 lines thick, firm yet tender; the seed about one-half as long as the fruit, nearly one-half as wide as long, broadest near the middle, light brown, rough. (Fig. 29.) The branches of the fruit clusters are bright orange.

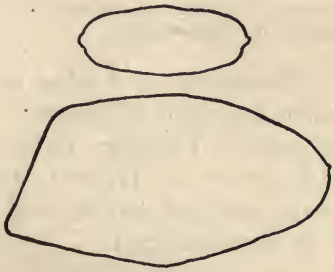

FIG. 29.—Outlines of Khalt Mooashem seed and fruit. (Natural size.)

A rare variety of the Jerid. The excellent fruit is characterized by its dark prune color, curiously scarred skin, copious flesh, and very sweet, highly attractive flavor. It apparently keeps perfectly. Thirteen offshoots were imported.

KHALT DEGLAOWIA (p. 104).—The name signifies "Khalt resembling a Deglet (Noor)." Fruit 1⅔ to 1¾ inches long, about one-half as wide, egg-shaped, narrowed from about the middle to the rounded apex, keeping its shape well when preserved, dark maroon purple when ripe, much of the skin loosened into soft blisters, the flesh

[a] Although the word "khalt" is generally defined as meaning a dry date, most of the "khalts" of the Jerid oases which have received special names are soft dates and often of excellent quality.

about 2 lines thick, firm yet tender; the seed about two-fifths as long as the fruit, about one-third as wide as long, cinnamon brown. (Fig. 30.) The stalks and branches of the fruit clusters are light yellow (not orange).

This variety occurs apparently only at Nefta, and is not common there. The fruit is rather small, with fairly thick, firm flesh. The fine flavor suggests that of the Deglet Noor, which it resembles also in the shape of the fruit and the maize-yellow color of the branches of the clusters. Of this rare variety only two offshoots could be procured.

KHALT HORRAOWIA (p. 105).—The name means "Khalt resembling Horra." Fruit 1⅛ to over 2 inches long, narrowed from near the base to the somewhat pointed apex, keeping its shape well when preserved, dark maroon purple when ripe; the flesh 2 to 3 lines thick, firm yet tender, very sugary; the seed about one-half as long as the fruit, about one-third as wide as long. (Fig. 31.) The branches

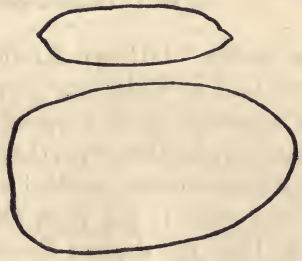

FIG. 30.—Outlines of Khalt Deglaowia seed and fruit. (Natural size.)

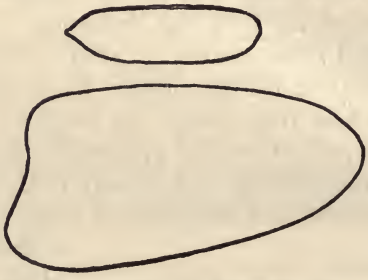

FIG. 31.—Outlines of Khalt Horraowia seed and fruit. (Natural size.)

of the fruit clusters are orange colored. The crown of foliage is well developed, the leaves large and the leaflets long and numerous.

A fine variety of the Jerid, by no means common. The large, handsome fruit somewhat resembles that of Horra (see p. 71), both in appearance and flavor. The flesh is copious, firm yet tender, and contains a great deal of sugar. Six offshoots were obtained.

VARIETIES OF MINOR IMPORTANCE.

DRY DATES.

BAYJOO (p. 97).—French orthography, Badjou. Fruit 1⅓ inches long, about two-thirds as wide, egg-shaped, purplish maroon or bay colored when ripe; the flesh 1½ lines thick; the seed nearly two-thirds as long as the fruit, one-half as wide as long, light brown. (Fig. 32.) The stalks and branches of the fruit clusters are pale orange colored. The leaves are numerous, short but with long stalks and rather stiff, the leaflets long and broad but rather sparse. The small, dense bunches of fruit hang down on long curved stalks.

Abundant in the Jerid, and occurs also in the Nefzaoua. It is one of the varieties most widely exported to other parts of Tunis and Algeria. Flavor nutty, agreeable, but not very characteristic, typical of the dry date class. Matures in October (the 20th, according to Masselot). Number of offshoots imported, 7, all from the Jerid.

REMTA (p. 98).—Also spelled Remtsa (probably a misprint). Fruit 1½ to 1⅔ inches long, about one-half as wide, oblong, somewhat pointed (bluntly) at the apex, generally distinctly constricted a little above the base, dark maroon colored when ripe; the flesh about 1 line thick, rather tough; the seed one-half to two-thirds as long as the fruit, a little less than one-half as wide as long. (Fig. 33.) The stalks and branches of the fruit clusters are bright orange.

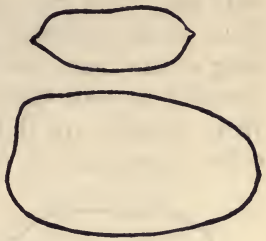

FIG. 32.—Outlines of Bayjoo seed and fruit. (Natural size.)

Occurs in the Jerid, especially at El Hamma, but appears to be uncommon. Is readily distinguished from other dry dates by being generally distinctly constricted a little above the base; hence resembling Boo Fagoos (see p. 67) in shape. Flesh firm, moderately sweet, with an agreeable flavor resembling that of Thaby (see p. 75), to which this variety appears to be closely related. Said to ripen early (in October) and not to be injured by autumn rains. Number of offshoots imported, 10.

HAMRA (p. 98).—The name means "red." Sometimes called Hamraia (referring to the tree rather than the fruit).[a] Fruit 1½ to 2 inches long, about one-half as wide, egg-shaped, tapering from near the base to the rounded apex, bright purplish maroon when ripe, the colors very handsome; the flesh 1 to 3 lines thick, becoming quite firm, the dark-colored outer zone thicker than the white central portion; the seed two-thirds to four-fifths as long as the fruit, generally about two-fifths as wide as long, sometimes with strongly developed wing-like ridges on the sides. (Fig. 34.) The stalks and branches of the fruit clusters are orange colored.

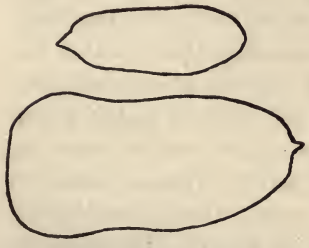

FIG. 33.—Outlines of Remta seed and fruit. (Natural size.)

Fairly common in the Jerid and the Nefzaoua, occurring also in Algeria. Is one of the largest and most showy of the dry dates. Much resembles Horra (see p. 71) and surpasses it in brightness of

[a] Hamra Bischry (or Bechry) is said by some of the natives of the Jerid to be identical with Hamra, although described in Algeria as a soft date. The "Hamraya" of the Mzab oases is also described as a soft date.

color, but is decidedly inferior to it in flavor. Ripens in the latter part of October and the beginning of November. Is not much esteemed by the natives. Said to keep well, having been enumerated at Kebili among the seven best preserving sorts. Number of offshoots imported, 4, all from the Jerid.

KENTEESHY (p. 99).—Also spelled Kentichi. Is known in Algeria as M'Kentichi Degla. Fruit about 1½ inches long, slightly more than one-half as wide, oblong or slightly inversely egg-shaped, dull bay when ripe, the skin remaining yellow; the flesh, 1 to 2½ lines thick, becoming hard and dry; the seed about two-thirds as long as the fruit, one-third to two-fifths as wide as long, broad and rounded at both ends. (Fig. 35.) The stalks and branches of the fruit clusters are dull orange. The palm is strong and vigorous, with coarse, heavy foliage, long leaves and numerous but rather distant long and broad leaflets. The stalks of the fruit clusters are curved, forming nearly a semicircle, but do not hang down below the foliage.

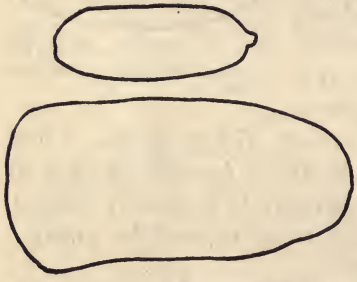

FIG. 34.—Outlines of Hamra seed and fruit. (Natural size.)

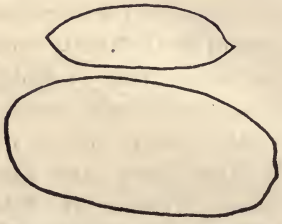

FIG. 35.—Outlines of Kenteeshy seed and fruit. (Natural size.)

Fairly common in the Jerid and much esteemed by the natives, who are reluctant to part with offshoots, notwithstanding the fact that the fruit is small, thin of flesh, and becomes hard and dry almost before it has lost its astringency. It ripens toward the end of October and beginning of November. It is moderately sweet and rather tasteless. It yields heavily, being one of the most productive varieties found in Tunis, and is said to give a good crop every year. It is reputed to be very alkali resistant, but to require plenty of water. Kenteeshy is said to thrive in poor soils where other varieties will not grow and to be often planted as a wind-break. Number of offshoots imported, 11, all from the Jerid.

SOFT DATES.

TANTABOOSHT (p. 99).—French orthography, Tantaboucht. Fruit nearly spherical, usually somewhat wider than long, 1 to 1½ inches in greatest diameter, usually widest above the middle, slightly depressed

at apex, not keeping its shape well when preserved, very dark brown purple (almost black) when ripe; the flesh 3 to 5 lines thick, very soft and dark colored; the large seed two-thirds to four-fifths as long as the fruit, one-half to two-thirds as wide as long, smooth. (Fig. 36.) The stalks and branches of the fruit clusters are deep orange colored.

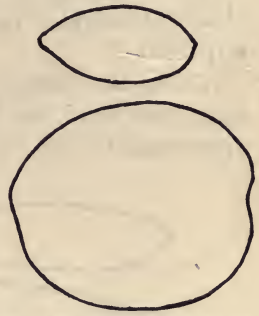

FIG. 36.—Outlines of Tantaboosht seed and fruit. (Natural size.)

Rare in the Jerid, common in Algeria. A date remarkable for its round shape and very soft, almost black flesh. Flavor peculiar and characteristic, even perfectly ripe fruit retaining a certain amount of astringency. Number of offshoots imported (from the Jerid), 5.

TOZER ZAID SAFRA [a] (p. 100).—Fruit 1½ to 1⅔ inches long, one-half to two-thirds as wide as long, oblong or oblong egg-shaped, widest near the middle, broad, and rounded at apex, not keeping its shape well when preserved; the flesh 1½ lines thick, extremely soft and sirupy, nearly black; the relatively large seed about one-half as long as the fruit, two-fifths to one-half as wide as long, light brown. (Fig. 37.) The leaves are long and very numerous, with short stalks, almost concealing the fruit clusters.

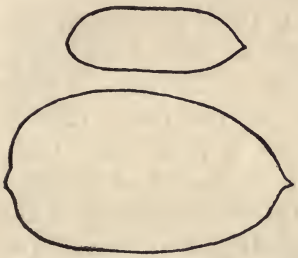

FIG. 37.—Outlines of Tozer Zaid Safra seed and fruit. (Natural size.)

Common in the Jerid. Flavor characteristic, resembling that of Baydh Hammam (p. 76), not attractive to the writer, but much appreciated by the natives. Generally eaten fresh, but sometimes preserved for a short time in skins. Yields heavily. Fruit ripens in the latter part of October. Said at Nefta to be one of the four most salt-resistant varieties. Number of offshoots imported, 9.

TOZER ZAID KHALA [b] (p. 100).—Fruit 1½ to 1¾ inches long, three-fifths to two-thirds as wide, inversely egg-shaped or oblong, broad and rounded at apex, not keeping its shape well

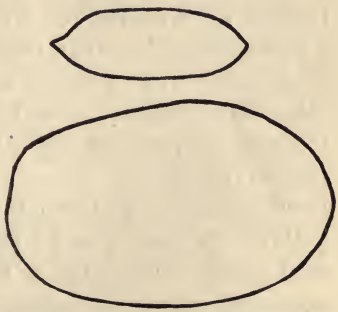

FIG. 38.—Outlines of Tozer Zaid Khala seed and fruit. (Natural size.)

[a] The very similar name "Taser Seit" is applied to a variety occurring in the Mzab oasis.

[b] Said to be known as Abdul Aziz (or Abd-el-Azaz) in the Oued Souf. A variety of the latter name occurs in the Oued Rirh.

when preserved; black when ripe; the flesh about 2 lines thick, very soft and sirupy, nearly black; the seed about two-fifths as long as the fruit, about two-fifths as wide as long, dark brown. (Fig. 38.)

Less common than the Tozer Zaid Safra variety, which it very closely resembles in appearance and flavor. Number of offshoots imported, 7.

Sayba Boo Dra (p. 102).—Fruit from 2 to more than 2½ inches long, less than one-half as wide, oblong, somewhat pointed at the apex, usually curved, prune purple when ripe, the surface rather dull; the flesh 3 to 3½ lines thick, rather firm; the slender seed about one-half as long as the fruit and not more than one-third as wide as long. (Fig. 39.) The stalks and branches of the fruit clusters are bright orange colored.

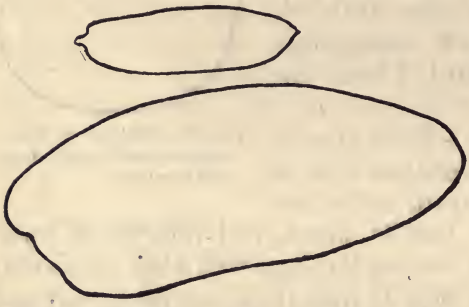

Fig. 39.—Outlines of Sayba Boo Dra seed and fruit. (Natural size.)

In Tunis apparently confined to the Jerid oases, where it is rare. Occurs also in the Oued Rirh in Algeria. The name signifies that, turned over endwise seven times, the fruit measures a cubit (20 inches), and is expressive of the great length of this huge date, the largest of the Tunisian varieties. Flesh thick, rather tough. Flavor agreeable, suggesting Boo Fagoos (see p. 67). It ripens about the end of October. Number of offshoots imported, 10.

Kharooby (p. 102).—French orthography, Kharroubi. Fruit about 2 inches long, less than two-fifths as wide, often wider near the apex than elsewhere, usually curved, between bay and maroon colored when ripe, the surface shiny; the skin conspicuously loosened and remaining light yellow; the flesh 1 to 2 lines thick, rather soft and dark colored; the seed nearly three-fifths as long as the fruit, one-third as wide as long, generally somewhat curved. (Fig. 40.) The stalks and branches of the fruit clusters are orange colored. The leaves are very long, crowded with long, broad leaflets.

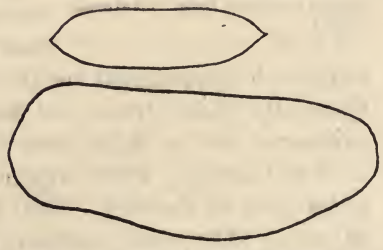

Fig. 40.—Outlines of Kharooby seed and fruit. (Natural size.)

Frequent, but not abundant, in the Jerid. Flesh of the ripe fruit of the consistency of thick jelly, moderately sweet, agreeable in flavor, resembling Lagoo (see p. 80). Said to preserve well. Ripens

in October. The offshoots remain small while attached to the parent tree. Number of offshoots imported, 2.

GASBY (p. 102).—Fruit about 2 inches long, about two-fifths as wide, oblong, often conspicuously curved, very dark prune purple with a conspicuous bloom when ripe, the surface dull, the skin tough, russet brown where loosened from the flesh; the flesh 1 line thick, dark colored, remaining soft; the slender seed not more than three-fifths as long as the fruit, not more than one-third as wide as long, russet brown, often curved. (Fig. 41.) The stalks and branches of the fruit clusters are deep orange colored. The crown of foliage is rather small and delicate, the leaves short, relatively long stalked, the leaflets long. The offshoots remain small while attached to the parent tree.

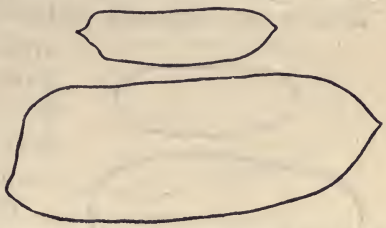

FIG. 41.—Outlines of Gasby seed and fruit. (Natural size.)

Common in the Jerid. Ripens very early, next after Ammary (see below), it is said; at the end of July, according to Masselot. A handsome, long, slender, dark-colored, generally curved date. Highly esteemed by some of the natives, while others say it is used mostly for making puddings and confectionery. The writer found its flavor, which is of the Lagoo type (see p. 80), rather attractive, suggesting that of raisins. It is said to keep very well. Number of offshoots imported, 19.

BENT SEGNY (p. 103).—Fruit 1¾ to 1⅞ inches long, about one-half as wide, inversely egg-shaped, square at base, rounded at the apex, keeping its shape poorly when preserved, very dark (almost black) purplish brown when ripe; the flesh 1½ lines thick, very dark colored and very soft; the seed about one-half as long as the fruit, two-fifths to one-half as wide as long, rounded at both ends. (Fig. 42.) The stalks and branches of the fruit clusters are deep orange colored.

FIG. 42.—Outlines of Bent Segny seed and fruit. (Natural size.)

Rather rare in the Jerid. A very soft, sirupy date, with a pleasant but not remarkable flavor. Ripens about the end of October. Number of offshoots imported, 3.

AMMARY (p. 103).—Fruit 1¼ to a little over 1½ inches long, about one-half as wide, generally inversely egg-shaped, square at the base, rounded at the apex, keeping its shape fairly well when preserved; dark brown purple when ripe; the flesh 1 to 1½ lines thick, very soft

and dark colored; the seed about two-thirds as long as the fruit, about two-fifths as wide as long, blunt at both ends. (Fig. 43.) The stalks and branches of the fruit clusters are orange colored. Foliage coarse and heavy, leaves very numerous, rather short stalked, with long, wide leaflets.

Common in the Jerid, the Nefzaoua, at Gabes, and in Algeria. Is the earliest maturing variety in Tunis, ripening in the Jerid in August (or even the middle of July, according to Masselot), and from September 1 to September 15 at Gabes. Said to give a good crop every year, and to be very productive. Fruit of rather mediocre quality. Number of offshoots imported, 12, all from the Jerid.

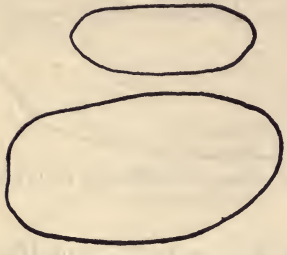

FIG. 43.—Outlines of Ammary seed and fruit. (Natural size.)

GOONDY (p. 103).—Fruit about 1⅜ inches long, about one-half as wide, inversely egg-shaped, oblong (broadest above the middle), keeping its shape fairly well when preserved, bay to maroon colored when ripe; the flesh about 1½ lines thick, dark colored, remaining rather soft; the seed more than one-half as long as the fruit, about one-third as wide as long. (Fig. 44.) The stalks and branches of the fruit clusters are bright orange colored. Foliage rather coarse, the leaves very numerous, short, and rather short stalked, the leaflets long and broad.

Rather common in the Jerid, and said to occur also in the Nefzaoua and at Biskra, in Algeria. Sweet and of agreeable but not pronounced flavor, of the Lagoo type. (See p. 80.) Ripens in the Jerid on October 20, according to Masselot, although the writer was told that it ripens sometimes as early as September 15. The fruit is preserved in skin bags for home use, but is not an article of commerce. Number of offshoots imported, 9, all from the Jerid.

FIG. 44.—Outlines of Goondy seed and fruit. (Natural size.)

KAROOY (p. 104).—Fruit 1⅜ inches long, about one-half as wide, egg-shaped, narrowed from near the base to the rounded apex, keeping its shape fairly well when preserved, bay colored when ripe; skin, where loose, olive-brown; the flesh about 1½ lines thick, rather tough; the seed more than one-half as long as the fruit, about one-third as wide as long. (Fig. 45.) The branches and stalks of the fruit clusters are orange colored.

A variety found in the Jerid, but not common. The name is not given in any published list of the varieties. Flesh rather tough,

moderately sweet, flavor agreeable, similar to that of the dry dates. Number of offshoots imported, 5.

TENASEEN (p. 105).—French orthography, Tanessin or Tenassine.) Fruit 1⅝ to 1¾ inches long, about one-half as wide, oblong, not keeping its shape well when preserved, black when ripe; the flesh very soft, nearly black; the seed about three-fifths as long as the fruit, about one-third as wide as long, rather dark brown.

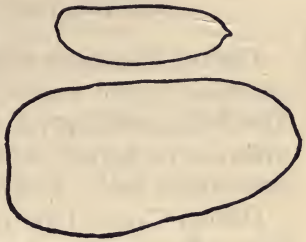

FIG. 45.—Outlines of Karooy seed and fruit. (Natural size.)

Rare in the Jerid, common in the Oued Souf and Oued Rirh in Algeria. The flavor of the very sweet, soft, dark-colored flesh suggests Tozer Zaid Safra (see p. 85), but is more agreeable. Is said to ripen in October. Crown of foliage horizontal, umbrella-like. One offshoot imported from the Jerid.

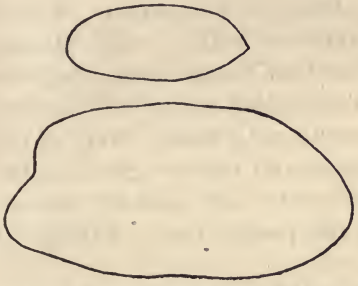

FIG. 46.—Outlines of Iteema seed and fruit. (Natural size.)

ITEEMA (p. 106).—(French orthography, Ytima.) The name means "an orphan girl." Fruit slightly more than 2 inches long, about one-half as wide, widest at or near the middle, rounded at base, somewhat pointed and conspicuously not symmetrical at apex, not keeping its shape well when preserved, chestnut brown, with a slight purple tinge when ripe, the surface shiny; the flesh over 2 lines thick, extremely soft; the seed nearly one-half as long as the fruit, about two-fifths as wide as long, chestnut colored. (Fig. 46.)

Rare in the Jerid, common in the Algerian oases. A very handsome date, with sirupy, translucent flesh, extremely sweet, rather insipid in flavor. An early ripening sort, maturing in the Jerid at the end of September (according to Masselot). Eaten fresh. Number of offshoots imported, 15 (2 only from Tunis, the rest from Algeria).

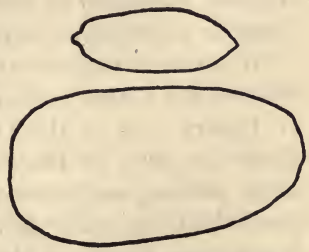

FIG. 47.—Outlines of Khalt Hameed seed and fruit. (Natural size.)

KHALT HAMEED (p. 106).—Fruit 1⅔ inches long, about one-half as wide, elliptical in form, generally slightly narrowed at both ends, keeping its shape well when preserved, bright maroon when ripe; the flesh 1½ lines thick, rather firm, not very sugary; the seed smooth, more than one-half as long as the fruit, about two-fifths as wide as long, widest above the middle. (Fig. 47.)

Occurs in the Jerid, but is not common. Said to be much liked by the natives when not perfectly ripe, but to the writer the flavor seemed inferior. Ripens at the end of October. Does not keep. Number of offshoots imported, 6.

VARIETIES IMPORTED BUT NOT INCLUDED IN THE KEY.

Deglet Barca.—Occurs in the Jerid, but is not common. Fruit not seen by the writer, but said to be round, of the same color as Tozer Zaid Safra (p. 85) (very dark brown, almost black), but different in flavor. It is described as a R'tob (soft date) that preserves very well. Number of offshoots imported, 7.

Deglet Caid.—Rare in the Jerid, and said to occur also in the Oued Rirh. Fruit not seen by the writer, but said to be coral red before maturity and black when ripe, and to be conservable only for a short time. Reported to be a fine variety, and to ripen early in September. Number of offshoots imported, 2.

Deglet Sennayga.—Occurs in the Jerid; not common. A soft date. Fruit about 1½ inches long, nearly one-half as wide, oblong, somewhat pointed at the apex, bright chestnut brown when ripe, surface shiny; skin much loosened and folded; flesh soft, dark colored; seed large, dark brown. Said to ripen early in October. Very sweet, flavor distinctive (suggesting burnt sugar) and rather agreeable, but not very pronounced. It is said to keep well. The offshoots remain small as long as they are attached to the parent tree. Number of offshoots imported, 9.

Gasb Haloo.—(Name spelled phonetically, as pronounced by the natives.) Occurs at Nefta. Is probably the same as the "Gsub (or Ksob) Halou" found in the Ziban and Oued Rirh oases of Algeria. Fruit not seen by the writer. Said to resemble Kenteeshy (p. 84) in color; described as sweeter and better flavored than Gasby (p. 87). Number of offshoots imported, 3.

Guern-el-Rhezal.—(Gazelle's Horn.) One of the principal varieties in the Gabes region and on the island of Jerba, occurring also at Biskra and in the Oued Rirh, Algeria, but rare in the Jerid. Fruit not seen by the writer. It is described by M. Minangoin as long, slender, and curved. The amins at Gabes say it is not a very good date, the stone being large and the flesh thin. "It has more bones than flesh," as they express it. This is said, however, to be one of the three varieties chiefly preserved at Mettoui, near Gabes, requiring first to be dried. Number of offshoots imported, 4.

Khadraya.—Name signifies "green." Occurs in the Jerid, but apparently is not common. A variety of the same name, but perhaps not identical, is found in Algeria. Belongs to the dry date class.

Fruit about 1½ inches long, about one-half as wide; oblong, narrowed at the apex, bright orange before maturity, dull light brown when ripe; seed large, light brown; branches of fruit clusters bright orange. Very sweet and with a pleasant flavor, suggesting Halooa Bayda (see p. 75). Ripens in October. Number of offshoots imported, 5.

Khalt Boo Fagoos.—A rare variety of the Jerid. Fruit of the soft type, very similar to that of Boo Fagoos (see p. 67), about 1⅔ inches long, 1 inch wide, generally more or less obovate, maroon colored when ripe, skin much blistered; flesh very firm; seed large; branches of fruit clusters light orange. Moderately sweet, with a fine flavor of the Horra type (see p. 71). Number of offshoots imported, 4.

Khalt Gama.—Occurs at Nefta. Fruit not seen by the writer. "Gama" means wheat, and the name is said to refer to the color of the fruit. Number of offshoots imported, 2.

Khalt Kebeer.—A variety of the Jerid, apparently not common. A fine, large, reddish brown, soft date, with small seed, preserving admirably. Flavor excellent, considered by the natives to resemble that of Boo Fagoos (see p. 67). Is a promising variety. Number of offshoots imported, 11.

Khalt Kentaowia.—Occurs in the Jerid; apparently not uncommon at Tozer. Fruit not seen by the writer. The foliage is well developed and handsome, the leaves very numerous, crowded with long leaflets. The name implies a resemblance to the Kenta variety (p. 72). Number of offshoots imported, 4.

Okht Ammary.—A variety of the Jerid, probably not common. Fruit not seen by the writer. Said to resemble Ammary (see p. 87), but to be larger. Reported to ripen at the end of September, and not to keep well. One offshoot was imported.

Sba Aroossa.—Name means "bride's fingers." Occurs in the Jerid, and also reported to occur in the Ziban oases, in Algeria. Is said to be rare and of fairly good quality. Fruit not seen by the writer. Reported to be a long, slender date, ripening in October and not keeping well. Number of offshoots imported, 6.

Towadant.—Occurs at Nefta, and is probably rare. Fruit not seen by the writer; said to be very large and long, yellow, and of good flavor, ripening at the same time as Fteemy, and keeping well. Number of offshoots imported, 4.

Zrai.—Name spelled phonetically as pronounced by the natives, not having been found in any published list. Occurs at Nefta. Fruit not seen by the writer; said to resemble Deglet Noor (p. 63) in color. Number of offshoots imported, 7.

VARIETIES INCLUDED IN THE KEY BUT NOT IMPORTED.

CHEDAKH (p. 106).—Is of the soft type. Fruit nearly 2 inches long, about one-half as wide, oblong, narrowed slightly at both ends, keeping its shape fairly well when preserved, purplish maroon when ripe; the flesh only 1 line thick, all of it soft and dark colored; the seed about three-fifths as long as the fruit and about one-third as wide as long. (Fig. 48.) The leaves are rather short, and the fruit clusters loose and open, with rather short, erect or ascending stalks.

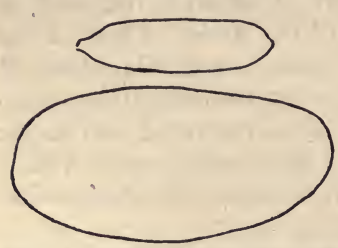

FIG. 48.—Outlines of Chedakh seed and fruit. (Natural size.)

Common in the Jerid, and said also to occur in the Nefzaoua. Is a "R'tob," the fruit being eaten fresh and not preserved. It is not highly esteemed by the natives, and the flavor is uninteresting. Ripens toward the end of October.

DEGLET HAMIDATOO (p. 105).—Fruit of the soft type, about 2 inches long, about one-half as wide, somewhat blunt pointed at the apex, elliptical, not keeping its shape well when preserved, light hazel brown when ripe; the flesh $2\frac{1}{2}$ lines thick, very soft and sirupy, translucent; the seed about one-half as long as the fruit, about one-third as wide as long, russet to chestnut colored. (Fig. 49.) The foliage is very well developed, the leaves numerous and long, crowded with long leaflets, the bunches of fruit rather loose and open, with ascending or spreading stalks.

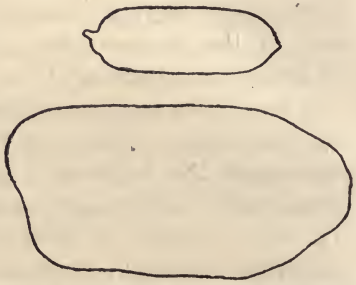

FIG. 49.—Outlines of Deglet Hamidatoo seed and fruit. (Natural size.)

A very rare variety of the Jerid, said to be represented at Tozer by only two trees. Reported to occur also in the oasis of Negrine, Algeria. It is said to be eaten only when fresh and not to be conservable. The fruit is of splendid appearance, beautifully colored, and extremely soft and sirupy when ripe. Although very sweet and rich, the flavor is rather insipid and soon cloys, like the Iteema (p. 89). Ripens in the latter part of October.

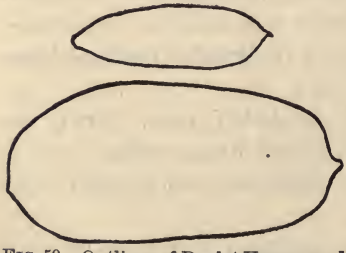

FIG. 50.—Outlines of Deglet Hassen seed and fruit. (Natural size.)

DEGLET HASSEN (p. 103).—Fruit of the soft type, $1\frac{2}{3}$ to $1\frac{3}{4}$ inches long, one-half as wide, inversely egg-shaped, tapering slightly at both extremities, not keeping its shape well when preserved, bright bay

colored when ripe; the skin, where loose, yellow; the flesh about 1½ lines thick, extremely soft, light colored, translucent; the slender seed about three-fifths as long as the fruit, not more than one-third as wide as long. (Fig. 50.) The trunk is slender, the leaves numerous, short, and comparatively long-stalked.

Said to be widely distributed in the Jerid, although the writer failed to secure offshoots. The offshoots are said to be worth 75 cents to $1.15 apiece, a price that would indicate this to be a highly esteemed variety. The fruit, said to be eaten only when fresh, is extremely soft and very sweet and rich, but soon cloys. Ripens in October.

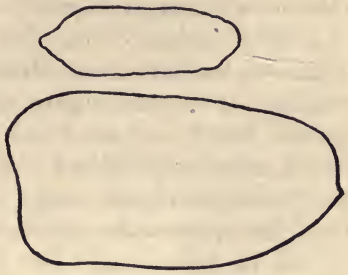

FIG. 51.—Outlines of Khalt Menakhry seed and fruit. (Natural size.)

KHALT MENAKHRY (p. 105).—The name signifies a "Khalt resembling Menakher."[a] Fruit of the soft type, from nearly to more than 2 inches long, about one-half as wide, egg-shaped, narrowed from about the middle to the broad, rounded apex, keeping its shape well when preserved, dark purplish maroon when ripe; the flesh 2 to 3 lines thick, firm, yet very sugary; the seed about one-half as long as the fruit, about two-fifths as wide as long, blunt at both ends. (Fig. 51.) The stalks and branches of the fruit clusters are light orange colored.

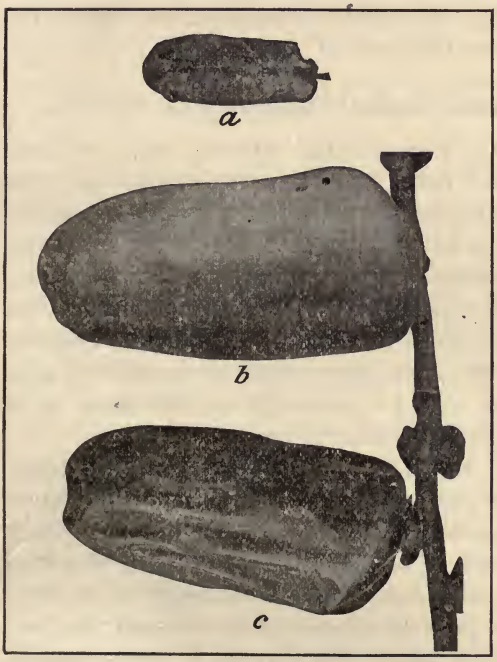

FIG. 52.—Selatny seed and fruits. (Natural size.)

Occurs at Nefta, in the Jerid, but is evidently very rare. The fine fruit very closely resembles Khalt Horraowia (p. 82) in appearance and flavor. Ripens in the latter part of October.

SELATNY (p. 104).—Fruit of the soft type, over 2 inches long, about one-half as wide, tapering from near the base to the somewhat pointed apex, keeping its shape well when preserved, bright bay colored when

[a] See footnote, p. 81.

ripe, the surface shining; the flesh 1½ lines thick, rather soft, translucent; the seed about one-half as long as the fruit, about two-fifths as wide as long, blunt at both ends, roughened with deep furrows near the base. (Fig. 52.) The stalks and branches of the fruit clusters are orange colored.

A rare variety of the Jerid; said also to occur in the Nefzaoua, and to be less rare there, although the writer saw no trees in the latter region. It is very highly esteemed by the natives and, although a special effort was made to obtain offshoots of this variety in the Jerid, none could be had. It is possible that an exhaustive search in the Nefzaoua region might result in obtaining offshoots. The fruit is of fine appearance and is said to be generally eaten fresh, although it can be preserved. The flavor somewhat resembles that of the Deglet Noor and is hardly inferior, while in size this variety compares favorably with the Menakher. It ripens in October (or even in September, according to Masselot). The palm has a stout trunk. The leaves are rather short and broad, with few spines. The stalks of the short fruit clusters are nearly horizontal and so short that together with the clusters they are hardly as long as the leafstalks. For the rarity of this variety the same explanation was given the writer as for that of Menakher (see p. 62).

DESCRIPTIVE KEY TO THE CHARACTERS OF THE FRUITS.

The characters given in the key of date varieties which follows were either noted on the spot from freshly gathered fruit or were subsequently worked out from samples and from natural-size photographs made in the field. In a few instances samples of fruit obtained in the autumn of 1905 at the cooperative date garden at Tempe, Ariz., from palms imported several years ago from Algeria, have also been used in making up the descriptions, such cases being always specifically mentioned. Owing to the scantiness of the material available in many cases, it is probable that the descriptions will have to be modified as we gain a better knowledge of the varieties.

In regard to measurements, width refers in every case to the greatest width of the fruit and the seed, thickness of flesh to the maximum thickness, and length of the stone is taken to exclude the apical point, or mucro, and the fibrous stipe. Color of the fruit, unless otherwise specified, refers to the parts where the skin adheres closely to the flesh. Where the skin has become loose in places, as in most of the soft dates when quite ripe, it has a lighter color, which is also generally described. The "germ pore" is a circular depression, 1 to 2 mm. in diameter, occurring on the back of the seed. When its position is not mentioned in the description it is understood that it occurs at or near the middle of the seed. The embryo is situated at this point and the shoot appears here at germination.

Much use has been made of the characters afforded by the colors of the fruit, seed, etc., the names of colors used being those given by Ridgway (Nomenclature of Colors for Naturalists, Boston, 1886). In order to facilitate comparison, each name of a color that occurs in the key is followed by a reference to the corresponding plate and figure in the work cited, thus: Maroon (IV, 2). The giant cells, to which the writer's attention was first called by Mr. W. T. Swingle, occur in a more or less sharply defined zone in the softer part of the flesh, close to the skin. It is really the hard, bright-colored, highly refractive masses of cell contents (probably consisting chiefly of tannins) that are here described. Their characters are taken only from thoroughly ripe fruit in which the cell contents have assumed their final shape, size, and color.

A word is necessary in regard to the form of the key. The varieties are divided, in the "Synopsis of the groups," first into two principal classes, the dry dates and the soft dates. Each group is then subdivided into a number of smaller groups. The designations selected for the two main groups should not be understood as implying that all the dry dates are necessarily hard and thin of flesh or that all the soft dates are rich and sirupy. While the extremes of the two types are very distinct, intermediate forms occur, which make it impossible to draw a hard and fast line between them. Exceptions occur in both categories, and some of the varieties of which the affinities are evidently with the first group have thicker and softer flesh than some of the varieties of the second group. In deciding to which of the two classes a given variety belongs, all of its characters must be taken into consideration. It should be explained that the classification, at least beyond the two main groups, is largely artificial, and is designed merely to aid in identifying the varieties. While in many cases it happens that several varieties that are undoubtedly closely related botanically are brought into juxtaposition in the key, this is by no means always the case.

The key to the varieties is not of the dichotomous form usually employed by systematic biologists, but is modeled upon that which was introduced by Mr. O. F. Cook in his studies of Myriapoda.[a] It has the advantage of eliminating one species (or variety) at every step. It will be noted that the whole key is arranged in pairs of paragraphs. Of each pair, the first paragraph describes a variety, and the second gives the characters which distinguish all of the same group which follow from the one that has just been separated out. Those characters in the first paragraph that are especially to be con-

[a] In a paper published in the Annals of the New York Academy of Science, 9, p. 8 (1895), a key of this style was first used by Mr. Cook. See also Proc. U. S. Nat. Mus., 18, p. 82 (1895).

trasted with the second paragraph are printed in italics, as is the second paragraph itself. The italicized portion, therefore, constitutes the key proper. Frequently an alternative set of characters, introduced by the words "or if," will be found in the second paragraph of the pair (as on p. 101). These alternative characters generally refer to the variety described in the first paragraph that immediately follows.

It is believed that by including in the key the complete description of each variety, the identification can be made with more confidence than if only the characters necessary for "keying out" the varieties were given. While the construction of a key of this type presents difficulties that are not encountered in making the ordinary dichotomous key, it is believed that the user, after a little practice, will find it more serviceable. He will have the satisfaction, as it were, of touching ground at each step he takes.

After the name of each variety, at the end of the paragraph describing it, is given a reference to the page of the text on which will be found outlines of the seed and fruit.

1. Synopsis of the Groups.

* Flesh becoming quite dry and often hard, the white central portion thicker than the darker colored, softer outer portion (often twice as thick);[a] the fibrous lining of the central cavity clean and dry, bright white; giant cells in a more or less sharply defined zone lying between the white and the dark flesh, very small, generally not much longer than wide.

Dry dates.

** Skin becoming loose over much of the surface of the fruit, forming large, smooth, soft, mostly longitudinal blisters.

Smooth-skinned dry dates, p. 97.

** Skin closely adhering to most of the surface of the fruit, forming a network of narrow, hard, transverse as well as longitudinal wrinkles, with few or no large, soft blisters.

Wrinkled dry dates, pp. 97 to 99.

* Flesh not becoming dry and hard, the white central portion thinner than the dark colored, softer outer portion; the fibrous lining of the central cavity usually more or less soaked and darkened with sirupy juice; zone of giant cells not usually sharply defined (or at least not easily distinguishable in color) from the zone outside it, the cells usually variable in size and shape; skin becoming loosened over much of the surface of the fruit when ripe,[b] forming large, soft, generally longitudinal blisters, but otherwise smooth; or, if forming also a network of narrow transverse wrinkles, these few and soft ---------- Soft dates.

** Fruit spherical or nearly so, at least three-fourths as wide as long.

Round soft dates, p. 99.

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[a] Exceptions are the varieties Bayjoo (p. 97), Thaby (p. 98) and Hamra (p. 98) in which the darker colored outer zone is much thicker than the white inner zone, at least in fruits that have been kept for some time. In other respects these are typical dry dates, having the clean, bright white lining of the central cavity and the skin covered with a network of hard, narrow wrinkles.

[b] The Khalt Mooashem variety (see p. 104) is an exception in having the skin closely adhering.

** Fruit not spherical or nearly so.
*** Fruit at least 3 mm. shorter than twice the width.
Broad soft dates.
**** Flesh dark colored, very soft and sirupy, date not keeping its shape well when ripe.
Sirupy broad soft dates, pp. 99–100.
**** Flesh rather firm, not sirupy, date keeping its shape well when ripe_____ Firm broad soft dates, pp. 100–101.
*** Fruit at least 3 mm. longer than twice the width.
Narrow soft dates, pp. 101–102.
*** Fruit about twice as long as wide_____ Intermediate soft dates.
**** Decidedly wider near the apex than at base.
Obovate intermediate soft dates, p. 103.
**** Decidedly wider at the base than near the apex, tapering from near or below the middle to the apex.
Ovate intermediate soft dates, pp. 103 to 105.
**** As wide or nearly as wide at the apex as at the base, either widest at or near the middle or else of about the same width throughout.
Oblong intermediate soft dates, pp. 105–106.

2. Key to the Varieties.

Dry Dates.

SMOOTH-SKINNED DRY DATES.

Fruit only 25 mm. long (smallest of the Tunisian varieties), *about 17.5 mm. wide*, ovate or obovate, bright bay (IV, 5) when ripe, the skin ochraceous (V, 7) to cinnamon rufous (IV, 16); *flesh 2.5 mm. thick*, becoming hard and dry, more than one-half of it consisting of the white central portion; seed 18 mm. long, about 9 mm. wide, smooth, drab brown (III, 18), the ventral channel narrow, open, the germ pore generally considerably above the middle; giant cells in a sharply defined zone forming about one-half the thickness of the dark outer part of the flesh, very small, nearly all rounded, rarely more than 1½ times as long as wide, mostly spherical but some elliptical and pear-shaped, orange colored; *branches of the fruit clusters bright (lemon) yellow*_____ *Angoo* (p. 74).

Fruit 35 to 40 mm. long, about one-half as wide, often slightly wider just above the middle than elsewhere, then narrowed to the truncate or blunt-pointed apex, dull bay (IV, 5) colored when ripe, the skin rufous (IV, 7) to hazel (IV, 12) colored; *flesh 3 to 4 mm. thick*, not becoming very dry; seed 21 to 25 mm. long, one-third to two-fifths as wide, rounded at both ends, Isabella brown (III, 23) in color, the ventral channel narrow, open, the germ pore above the middle; giant cells very uniform in size and shape, spherical or nearly so, rufous (IV, 7) colored; *branches of the fruit clusters light orange*_____ *Kenta* (p. 73).

WRINKLED DRY DATES.

Fruit about 32.5 mm. long, three-fifths to two-thirds as wide, ovate in outline, dull orange yellow before maturity, purplish maroon (IV, 2) or bay (IV, 5) colored when ripe; flesh 3 mm. thick, the white central portion much thicker than the dark outer zone;[a] *seed* averaging 20 mm. long and *10 mm. wide*, Isabella brown (III, 23), the ventral channel wide, open, the *germ pore near the apex of the seed*, conspicuous; *giant cells* very small, *all rounded, nearly all spherical*, orange rufous (IV, 13) in color; branches of the fruit clusters pale orange_____ *Bayjoo* (p. 83).

Fruit only about twice as long as wide.

[a] Although in fruits cut open several weeks after gathering the converse appears to be true, owing to the suffusion of the white zone with sirup from the dark portion.

Fruit mostly distinctly constricted a little above the base, 35 to 40 mm. long, oblong in outline, somewhat narrowed at the apex, dark maroon (IV, 2) when ripe; *flesh* 2 to 2.5 mm. thick, rather tough, *the white core much thicker than the dark-colored outer flesh;* seed averaging 22 mm. long, a little less than one-half as wide, widest near the apex, the ventral channel open, the germ pore below the middle; *giant cells* in a very sharply defined narrow zone, very small, *rounded*, mostly spherical or short elliptical, some pear-shaped, at least two-thirds as wide as long, cadmium orange (VI, 2) in color; branches of the fruit clusters bright orange.
Remta (p. 83).

Fruit not constricted, or, if constricted, then the dark outer zone of flesh thicker than the white inner portion and about one-half of the giant cells angular.

Fruit sometimes indistinctly constricted a little above the base, 40 to 42.5 mm. long, *oblong*, somewhat narrowed at the apex, *bright madder brown* (IV, 3) *to orange rufous* (IV, 13) *when ripe;* flesh 2.5 to 3 mm. thick, rather tough, the dark-colored outer portion appearing to be much thicker than the (thin) white core;[a] seed averaging 24.5 mm. long and about 9 mm. wide, the ventral channel wide, open, the germ pore above the middle. giant cell zone indistinct, *the cells very small, about one-half angular and one-half rounded*, generally one-half to two-thirds as wide as long, elliptical or rectangular in outline, saffron (VI, 4) in color; branches of the fruit clusters rich orange_____ *Thaby* (p. 75).

Fruit not constricted, of some darker or duller color (*bay* (IV, 5) *to purplish maroon* (IV, 2)), *giant cells all rounded, or, if a considerable number angular, then the fruit distinctly ovate in outline and purplish maroon in color.*

Dark-colored (*outer*) *zone of the flesh thicker than the white inner portion; giant cells frequently angled* but the majority rounded, as often elliptical as spherical, *often twice* (but generally 1 to 1½ times) *as long as wide;* ocher yellow (V, 9) to ochraceous rufous (V, 5) in color; fruit ovate, tapering from or near the base to the rounded apex, 35 to 47.5 mm. long, rufous (IV, 7) or orange rufous (IV, 13) before maturity, bright purplish maroon (IV, 2) when ripe, the colors very handsome; flesh 2 to 6 mm. thick; seed two-thirds to four-fifths as long as the fruit, generally about two-fifths as wide as long, often with strongly developed, wing-like lateral ridges, the ventral channel generally open, the germ pore generally near the middle but sometimes almost at the base; branches of the fruit clusters cadmium orange (VI, 2)_____ *Hamra* (p. 84).[b]

Dark-colored (*outer*) *zone of the flesh much thinner than the white inner portion; giant cells all rounded and generally spherical, rarely more than 1½ times as long as wide.*

Fruit ovate, tapering from the base to the rounded apex, 45 to 47½ mm. long, rather dull maroon purple when ripe, with a pronounced bloom; *flesh ¼ to 5 mm. thick, firm and becoming rather dry;* seed very irregular in size but averaging 24 mm. long and 9.5 mm. wide, the ventral channel closed, the germ pore above the middle, sometimes near the apex; giant cells very small, ochraceous rufous (V, 5) in color; branches of the fruit clusters cadmium yellow (VI, 6)_____ *Horra* (p. 72).

Fruit not ovate, not tapering to the apex from below the middle, elliptical in outline, somewhat narrowed at both ends; flesh not exceeding 3.5 mm. thick.

Skin, where loose, between deep chrome (VI, 9) *and saffron* (VI, 4); *giant cells* ferruginous (IV, 10) in color, *forming a very sharply defined zone separated from the skin by a thicker layer of soft, dull-colored flesh;* fruit 35 to 38 mm. long, sometimes slightly obovate, but generally widest at or below the middle, dull orange just before maturity, dull bay (IV, 5)

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[a] In this respect Thaby appears to be exceptional among the dry dates, but owing to the fact that, in fruits that have been kept for some time, sirup from the dark, soft outer zone suffuses the white, firm inner portion of the flesh (as noted in the footnotes on pp. 96 and 97), this character should not be given too much importance.

[b] Description supplemented by material from palms in the Tempe, Ariz., date garden which were obtained at Biskra, Algeria.

when ripe; flesh 2.5 to 5 mm. thick, becoming hard and dry; seed about two-thirds as long as the fruit, one-third to two-fifths as wide as long, broad and rounded at both ends, between russet (III, 16) and wood brown (III, 19), the ventral channel open; branches of the fruit clusters orange buff (VI, 22)---------- *Kenteeshy* [a] (p. 84).

Skin, where loose, russet (III, 16); *giant-cell zone less sharply defined, with groups of these cells extending through the outer layer of flesh nearly to the skin.*

Ripe fruit dull purplish maroon (IV, 2), with considerable bloom, *35 to 40 mm. long*, often somewhat curved; flesh 2.5 to 4 mm. thick; seed about two-thirds as long as the fruit, generally one-third as wide as long, the ventral channel open; *giant cells wax yellow* (VI, 7); branches of the fruit clusters orange colored---------- *Lemsy* (p. 75).

Ripe fruit dull bay (IV, 5) (dull Indian purple (VIII, 6) toward base), with considerable bloom, *32.5 to 35 mm. long;* flesh 2 to 3 mm. thick; seed about seven-tenths as long as the fruit, one-third to two-fifths as wide as long, the ventral channel open; *giant cells tawny* (V, 1) *brown;* branches of the fruit clusters pale orange---------- *Halooa Bayda* [b] (p. 76).

SOFT DATES.

ROUND SOFT DATES.

Fruit 35 to 45 mm. in greatest diameter, mostly longer than wide, spherical or nearly so, *keeping its shape well when preserved, color before maturity dull orange brown, between maroon* (IV, 2) *and prune purple* (VIII, 1) *when ripe;* skin, where loose, tawny (V, 1); *flesh firm*, 8 to 10 mm. thick; *seed* very thick, six-tenths to seven-tenths as long as the fruit, about three-fifths as wide as long, *conspicuously roughened with longitudinal and transverse furrows*, the ventral channel closed, the germ pore not distinguishable; giant cells mostly spherical or quadrangular with rounded angles, rarely more than one and one-half times as long as wide, ferruginous (IV, 10) in color---------- *Tronja* (p. 67).

Fruit 25 to 35 mm. in greatest diameter, usually somewhat wider than long, usually widest above the middle, often slightly depressed at the apex, *not keeping its shape well when preserved, deep chrome yellow* (VI, 8) *before maturity, very dark brown purple* (*almost black*) *when ripe; flesh very soft*, 6 to 10 mm. thick, very dark colored; *seed* two-thirds to four-fifths as long as the fruit, one-half to two-thirds as wide as long, mummy brown (III, 10) to russet (III, 16) color, *smooth*, the ventral channel nearly closed except near the apex; giant cells very variable in size and shape, spherical, elliptical or irregularly triangular or quadrangular with rounded angles, mostly one to one and one-half (rarely more than 2) times as long as wide, burnt umber (III, 8) colored; branches of the fruit clusters deep orange---------- *Tantaboosht* [c] (p. 85).

BROAD SOFT DATES.

Sirupy Broad Soft Dates.

Fruit 32.5 to 35 mm. long, about three-fourths as wide, *very broad ovate, widest at the base and narrowed thence to the broad rounded apex, bright bay* (IV, 5) *colored* with a pronounced bloom *when ripe;* flesh very soft, about 3 mm. thick, translucent; seed wood brown (III, 19), one-half to two-thirds as long as the fruit, about one-half as wide as long, rounded at

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[a] Description supplemented by fruit from the garden at Tempe, Ariz., from a palm originally from Biskra, Algeria.

[b] The fruits of young palms labeled *Halooa* in the Tempe garden, originally from Biskra, Algeria, differ from the above description in several particulars and probably belong to another variety. It should be noted that in Tunis the word Halooa (sweetmeat) occurs as a prefix in the names of several very different varieties of dates. Thus, Halooa Ch'eb, Halooa Teboolboo, etc.

[c] Description supplemented from the fruit of 3 palms in the Tempe, Ariz., date garden.

both ends, the ventral channel open throughout its length, the germ pore a little above the middle; giant cells mostly spherical, some short elliptical, a few angular, orange rufous (IV, 13) in color; branches of the fruit clusters light orange_____*Mokh Begry* (p. 76).

Fruit, wider at or above the middle than at the base, very dark brown or black when ripe.

Fruit ovate, rather abruptly narrowed near the somewhat pointed apex, 40 to 42.5 mm. long, from a little less to a little more than one-half as wide; bright orange before maturity, *dark chestnut* (IV, 9) *with a tinge of maroon* (IV, 2) *when ripe;* flesh about 4 mm. thick; seed 20 to 25 mm. long, one-third to two-fifths as wide, burnt umber color (III, 8), the ventral channel open, the germ pore above the middle; giant cells nearly all rounded, either spherical or short elliptical, one and one-half to two times as long as wide, tawny (V, 1) colored; branches of the fruit clusters orange_____ *Baydh Hamman* (p. 77).

Fruit oblong or somewhat obovate, rounded at the broad apex, black or nearly so when ripe.

Fruit oblong or oblong ovate, 35 to 40 mm. long, generally more than one-half to two-thirds as wide, *bright orange before maturity, very dark brown (almost black) when ripe*, skin where loose raw umber (III, 14) colored; flesh 3 mm. thick; seed about one-half as long as the fruit, two-fifths to one-half as wide as long, *light brown (between Isabella* (III, 23) *and fawn* (III, 22) *color), the ventral channel open nearly or quite throughout its length, the germ pore considerably above the middle, very distinct; giant cells mostly angular* (quadrangular) but many spherical, ferruginous (IV, 10) in color_____*Tozer Zaid Safra* (p. 85).

Fruit generally oblong obovate, 37.5 to 42.5 mm. long, three-fifths to two-thirds as wide, *dark maroon* (IV, 2) *before maturity, black when ripe;* flesh about 4 mm. thick; seed about two-fifths as long as the fruit, two-fifths as wide as long, *burnt umber color* (III, 8) *the ventral channel almost completely closed, the dorsal circle at the middle, not very distinct; giant cells nearly all rounded*, mostly spherical, ferruginous (IV, 10) in color_____*Tozer Zaid Khala* (p. 85).

Firm Broad Soft Dates.

Flesh thin (not exceeding 2.5 mm. in thickness), becoming very firm and dry, more than half of it consisting of a white fibrous core, fruit 25 mm. long. *Angoo.*[a]

Flesh thick (at least 4 mm. in thickest part), not becoming very dry, the white fibrous core forming much less than half of its thickness, fruit at least 32.5 mm. long.

Skin loosening in a network of narrow wrinkles as well as large soft blisters, orange rufous (IV, 13) *where loose; fruit* 35 to 37.5 mm. long, ovate or oblong ovate in outline, *widest at or below the middle*, purplish maroon (IV, 2) or bay colored (IV, 5) when ripe; flesh 4 to 5 mm. thick, firm yet tender; seed averaging 22 mm. long and 9 mm. wide, russet (III, 16) colored, the ventral channel open; giant cells in a well-defined zone, very small, irregularly quadrangular with rounded angles, to nearly elliptical or spherical in outline, wax yellow (VI, 7) to orange (VI, 3) in color; branches of the fruit clusters deep orange_____*Kseba* (p. 77).

Skin loosening in large soft blisters but not developing a network of narrow wrinkles.

Fruit about 37.5 mm. long, 22 to 26 mm. wide, *ovate (widest near the base), the surface dull*, orange colored before maturity, between maroon (IV, 2) and prune purple (VIII, 1) when ripe; skin where loose ochraceous (V. 7) to russet (III, 16); flesh 3 to 4 mm. thick, the central white fibrous core forming nearly one-half the total thickness; seed 18 or 19 mm. long, 9 or 10 mm. wide, narrowed at both ends, the ventral channel frequently

[a] This is properly a dry date and is described on p. 97; but on account of its smooth, blistered rather than wrinkled skin it might be sought in this part of the key.

closed, the germ pore a little above the middle; giant cells mostly about as wide as long and angular (irregularly quadrangular, pentagonal, etc., with rounded angles), orange rufous (IV, 13) in color; branches of the fruit clusters light orange_____ *Doonga* (p. 78).

Fruit obovate or obovate oblong (widest at or above the middle), its surface shining, at least 40 mm. long or, if shorter, the seed with more or less conspicuous wing-like lateral ridges.

Fruit 32.5 to 37.5 mm. long, about two-thirds as wide, bright bay (IV, 5) colored, the skin where loose tawny ochraceous (V, 4); flesh 4 mm. thick, light brown; *seed with more or less conspicuous lateral wing-like ridges*, two-thirds to three-fourths as long as the fruit, generally two-fifths as wide as long, broad at both ends, the ventral channel frequently closed; giant cells mostly spherical or very short elliptical, saffron yellow (VI, 4)_____ *Besser Haloo* (p. 78).

Fruit 40 mm. or longer, the seed without wing-like ridges (although sometimes roughened).

Fruit somewhat fiddle-shaped, widest above the middle but often somewhat narrowed at the extreme apex, *constricted near the middle*, 40 to 45 mm. long, 22.5 to 25 mm. wide, greenish yellow before maturity, between maroon (IV, 2) and prune purple (VIII, 1) when ripe; skin where loose ochraceous (V, 7); flesh 5 mm. thick, firm but tender; seed about three-fifths as long as the fruit, about one-third as wide as long, the ventral channel open, germ pore small and inconspicuous; *giant cells all rounded, decidedly longer than wide, ferruginous* (IV, 10) *in color;* branches of the fruit clusters orange_____ *Boo Fagoos* (p. 67).

Fruit not fiddle-shaped nor constricted near the middle, giant cells angular, about as wide as long, saffron yellow (VI, 4) *to light orange* (VI, 3) *in color.*

Fruit 45 to 50 mm. long, slightly more than one-half to three-fifths as wide, *conspicuously wider above than below the middle, then narrowed to the blunt apex, bright orange before maturity, bright purplish maroon* (IV, 2) *when ripe;* skin loose over much of the surface, ochraceous (V, 7) to ochraceous rufous (V, 5); flesh 6 to 7 mm. thick; seed 24 to 27 mm. long, about two-fifths as wide, cinnamon brown (III, 20), the ventral channel open; *branches of the fruit clusters deep orange.*

Boo Affar (p. 66).

Fruit 40 to 60 mm. long, one-half to two-thirds as wide, *only slightly wider above than below the middle, broad and rounded at apex, dull orange before maturity, light bay* (IV, 5) *or hazel* (IV, 12) *colored when ripe*, the skin in large part loose and conspicuously blistered in the ripe fruit, orange (VI, 3) to ochraceous (V, 7) in color; flesh 5 to 6 mm. thick; seed about one-half as long as the fruit, less than one-half as wide as long, cinnamon rufous (IV, 16) in color, its surface roughened here and there with irregular ridges and furrows, the ventral channel frequently closed, the germ pore above the middle; giant cells very diverse in shape and size, irregularly quadrangular, pear or cigar shaped, saffron (VI, 4) to orange (VI, 3) in color; *branches of the fruit clusters light orange.*

Areshty (p. 71).

NARROW SOFT DATES.

Skin conspicuously marked with short, linear scars, fruit 47.5 to 52.5 mm. long, 17.5 to 20 mm. wide, oblong, tapering slightly from base to apex, not curved or very slightly so, *bright bay* (IV, 5) *when ripe*, the skin where loose ochraceous (V, 7) colored; flesh 3 to 4 mm. thick, soft, translucent; seed 30 mm. long, about one-third as wide, the ventral channel sometimes closed, the germ pore considerably above the middle, very distinct; *giant cells* mostly 2 to 3 times as long as wide, *mostly angular or pointed*, raw sienna (V, 2) colored_____ *Tafazween* (p. 68).

Skin not marked with linear scars, giant cells rounded, or, if angular, the fruit prune purple (VIII, 1) *when ripe.*

Fruit 50 to 62.5 mm. long, 22.5 to 27.5 mm. wide, oblong, somewhat pointed at apex, usually curved, greenish yellow before maturity, prune purple (VIII, 1) with considerable bloom when ripe; skin where loose russet

(III, 16), surface dull; *flesh 6 to 7 mm. thick*, rather tough; seed 25 to 30 mm. long, about one-third as wide, the ventral channel very open; *giant cells variable in shape, many angular or sharp pointed*, others spherical or elliptical, 1 to 3 times (the great majority 1 to 1½ times) as long as wide, ferruginous (IV, 10) in color; branches of the fruit clusters bright orange_____*Sayba Boo Dra* (p. 86).

Fruit not exceeding 52.5 mm. long, giant cells with rounded outlines, none or very few angular.

Fruit not curved, 50 to 52.5 mm. long, about 20 mm. wide, oblong, somewhat pointed, yellowish to reddish orange before maturity, *deep maroon* (IV, 2) *to prune purple* (VIII, 1) *when ripe*, the skin russet (III, 16) where loose, shiny; flesh 5 to 6 mm. thick, soft; seed slender, 23 to 26 mm. long, less than one-third as wide, between russet (III, 16) and burnt umber (III, 8) colored, the ventral channel narrow, open; giant cells mostly elliptical, many spherical, a few rod-shaped (more than twice as long as wide) none angular, deep ferruginous (IV, 10) in color; branches of the fruit clusters orange_____*Okht Fteemy* (p. 79).

Fruit more or less curved or, if straight, bay (IV, 5) *to light maroon* (IV, 2) *in color.*

Fruit straight or nearly so, 40 to 50 mm. long, two-fifths to nearly one-half as wide, oblong or somewhat obovate in outline, *not keeping its shape well when ripe*, conspicuously mucronate, orange before maturity, bay (IV, 5) colored when ripe, skin where loose russet (III, 16), shiny; *flesh 4 to 8 mm. thick, very soft and sirupy;* seed 25 to 28 mm. long, two-sevenths to one-third as wide, broad and rounded at both ends, ventral channel closed near the middle or open throughout; giant cells usually spherical but often short elliptical, never angular, rarely more than one and one-half times as long as wide, orange (VI, 3) to russet (III, 16) colored; branches of the fruit clusters bright orange_____*Rhars* [a] (p. 79).

Fruit more or less curved, keeping its shape well when ripe, flesh not more than 4 mm. thick, rather firm.

Skin mostly loose, light yellow (between saffron (VI, 4) *and maize* (VI, 21)), *blistering conspicuously* in ripe fruit; fruit about 50 mm. long, less than two-fifths as wide, oblong, often somewhat larger near the apex than elsewhere, between bay (IV, 5) and maroon (IV, 2) when ripe, its surface shiny; flesh 2.5 to 3.5 mm. thick, rather soft; seed 27 to 28 mm. long, about one-third as wide, generally somewhat curved, between fawn (III, 22) and cinnamon (III, 20) colored, the ventral channel open, the germ pore considerably above the middle, conspicuous; giant cells spherical to short elliptical (the great majority less than twice as long as wide), none angular, deep ferruginous (IV, 10) in color; branches of the fruit clusters orange_____*Kharooby* (p. 86).

Skin not conspicuously blistered, russet (III, 16) *or hazel* (IV, 12) *colored.*

Fruit 45 mm. long, 20 mm. wide, oblong, tapering slightly to the apex, *bay* (IV, 5) *to light maroon* (IV, 2) *in color when ripe*, rather shiny; *flesh 3.5 to 4 mm. thick*, rather tough; seed 27 to 30 mm. long, about one-third as wide, russet (III, 16), its surface roughened with fine wrinkles, the ventral channel open, the germ pore below the middle; *giant cells spherical to rod-shaped, many of them 3 times as long as wide, none angular, raw sienna* (V, 2) *in color;* branches of the fruit clusters orange_____*Lagoo* (p. 80).

Fruit 45 to 50 mm. long, about two-fifths as wide, oblong, often strongly curved, *very dark prune purple* (VIII, 1) with a conspicuous bloom *when ripe;* skin rather tough, *not shiny; flesh 2 mm. thick;* seed 25 to 30 mm. long, about one-third as wide, russet (III, 16), often curved, the ventral channel narrow, open; *giant cells sometimes angular or pointed, the majority spherical, few more than one and one-half times as long as wide, orange ochraceous* (V, 3) *in color;* branches of the fruit clusters deep orange. *Gasby* (p. 87).

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[a] Description supplemented from fruit from Tempe, Ariz., garden, borne by 2 palms originally from Biskra, Algeria.

INTERMEDIATE SOFT DATES.

Obovate Intermediate Soft Dates.

Fruit 42.5 to 45 mm. long, square at base, rounded at apex, bright orange before maturity, *becoming very dark (almost black) brown purple when ripe;* flesh about 3 mm. thick, very dark colored and very soft, fruit keeping its shape poorly when ripe; seed 20 to 24 mm. long, two-fifths to one-half as wide, rounded at both ends, the ventral channel rather wide, open; *giant cells extremely variable in shape and size, mostly sharp angled and even pointed, triangular or quadrangular in outline,* orange rufous (IV, 13) in color; branches of the fruit clusters deep orange.
Bent Segny (p. 87).

Fruit maroon (IV, 2) *or bay* (IV, 5) *when ripe; giant cells fairly uniform in shape and size, not pointed or triangular.*

Fruit 40 to 42.5 mm. long, tapering slightly at both ends, extremely soft, *not keeping its shape when preserved,* bright bay (IV, 5) when ripe, skin where loose saffron colored (VI, 4); flesh about 3 mm. thick, translucent, light colored; seed 24 to 26 mm. long, about one-third as wide, the ventral channel open; *giant cells all rounded,* mostly spherical but a few elliptical, none more than twice as long as wide, mostly much smaller than in Bent Segny, orange rufous (IV, 13) in color.....*Deglet Hassen* (p. 92).

Fruit not exceeding 40 mm. long, moderately soft, keeping its shape fairly well when preserved; giant cells many of them angular.

Fruit very dark colored (between prune purple (VIII, 1) *and brown) when ripe,* 30 to 38 mm. long, generally obovate or obovate oblong, square at base, rounded at apex; skin where loose burnt umber (III, 8) color; flesh 2 to 3 mm. thick, very soft and dark colored; fibrous lining of the central cavity well developed; seed about two-thirds as long as the fruit, about two-fifths as wide as long, blunt at both ends, mars brown (III, 13) in color, the ventral channel open, the germ pore very indistinct; *giant cells chiefly spherical or short elliptical* but many quadrangular with rounded angles, *few of them more than one and one-half times as long as wide,* tawny (V, 1) in color; branches of the fruit clusters orange (VI, 3).....*Ammary* [a] (p. 88).

Fruit bay (IV, 5) *or maroon* (IV, 2) *when ripe; giant cells all or nearly all angular, mostly not longer than wide, almost never more than one and one-half times as long as wide.*

Fruit about 40 mm. long; seed averaging 25 mm. long, about one-third as wide, *the ventral channel wide, open, the germ pore near the base;* flesh about 3 mm. thick; *giant cells mostly angular but many spherical,* the great majority not longer than wide (⅓ to ½ as large as in Deglet Hassen), orange ochraceous (V, 3) in color; branches of the fruit clusters bright *orange*..... *Goondy* (p. 88).

Fruit 35 to 37.5 mm. long; flesh about 3 mm. thick; *seed averaging 20 mm. long,* about two-fifths as wide, *the ventral channel, narrow but open; giant cells all more or less angular,* (about twice as large as in Goondy), ochraceous (V, 7) in color; branches of the fruit clusters orange..... *Zekry* (p. 81).

Ovate Intermediate Soft Dates.

Firm white central portion of the flesh at least twice as thick as the soft, dark-colored outer portion.....*Kenta.* [b]

Firm white central portion of the flesh not nearly so thick as the soft, dark-colored outer portion.

White fibrous lining of the central cavity little developed; fruit 35 to 50 mm. long, narrowed from about the middle to the rounded apex and often

[a] Description drawn up from material from Tempe, Ariz., garden, from a palm originally from Ourlana, Algeria.

[b] This variety (as well as the Angoo, p. 97) belongs evidently to the dry date class, and is described on p. 97; but, on account of its smooth, very loose skin (narrow transverse wrinkles few or none), it is likely to be sought in this part of the key.

also to the base, orange rufous (IV, 13) before maturity, maroon (IV, 2) when ripe, its skin ochraceous (V, 7) colored where loose, shiny; flesh soft, 4 to 6 mm. thick; *seed* a little more than half as long as the fruit, *generally conspicuously pointed at the apex and often narrowed to the base, very smooth, chestnut* (IV, 9) *colored;* the ventral channel more or less closed; giant cells mostly rounded (a few with rounded angles), either spherical or short elliptical (1 to 2 times as long as wide), rufous (IV, 7) colored, branches of the fruit clusters maize (VI, 21) yellow.

Deglet Noor (p. 63).

White fibrous lining strongly developed throughout the length of the central cavity; seed generally rounded at both ends, rough, light colored (*cinnamon* (III, 20) *to Isabella* (III, 23) *brown*).

Ripe fruit dark prune purple, its skin adhering closely to the flesh, (*very little blistered or wrinkled*), *conspicuously marked with transverse and longitudinal linear scars;* fruit 40 to 45 mm. long, narrowed from about the middle to the rounded apex, keeping its shape perfectly when ripe; flesh about 4 mm. thick, firm but tender; seed 22 to 23 mm. long, nearly one-half as wide, widest near the middle, rounded at the ends, the ventral channel closed; giant cells very small, the majority angular (generally somewhat regularly quadrangular), but many spherical or pear-shaped, rarely more than one and one-half times as long as wide, orange rufous (IV, 13) colored; branches of the fruit clusters bright orange.

Khalt Mooashem (p. 81).

Ripe fruit not darker in color than purplish maroon (IV, 2), *much of the skin blistered, not scarred.*

Branches of the fruit clusters maize yellow (VI, 21); *fruit 40 to 42.5 mm. long,* narrowed from about the middle to the rounded apex, *between maroon* (IV, 2) *and prune purple* (VIII, 1) *when ripe,* with considerable bloom; skin where loose tawny ochraceous (V, 4), somewhat shiny; flesh about 4 mm. thick; seed about two-fifths as long as the fruit, about one-third as wide as long, cinnamon brown (III, 20), the ventral channel open, the germ pore above the middle; *giant cells* very uniform in shape and size, *nearly all rounded and spherical,* ferruginous (IV, 10) *in color*_____*Khalt Deglaowia* (p. 82).

Branches of the fruit clusters orange (VI, 3), *fruit 45 to 50 mm. long or, if shorter, the ripe fruit bay colored* (IV, 5) *and the giant cells mostly sharp-angled.*

Fruit 40 mm. long, narrowed from near the base to the rounded apex, dull orange before maturity, *bay colored* (IV, 5) *when ripe,* skin where loose tawny olive (III, 17), somewhat shiny; *flesh about 3 mm. thick,* rather tough; seed 23 to 25 mm. long, about one-third as wide, the ventral channel open; *giant cells* very diverse in shape and size, *the great majority sharp-angled* (very few spherical), and irregularly triangular or quadrangular in outline, sometimes irregularly club-shaped or cigar-shaped, often sharp-pointed or even aristate, more than half of them 2 to 3 times as long as wide, orange (VI, 3) to orange rufous (IV, 13) in color_____*Karooy* (p. 89).

Fruit 45 to 50 mm. long; giant cells all rounded or, if sharp-angled, the color of the fruit dark (*between maroon* (IV, 2) *and prune purple* (VIII, 1) *and the flesh 4 to 6 mm. thick.*

Flesh only 3 mm. thick, translucent, soft, *sugar not crystallizing on the cut surface; fruit 50 mm. long,* tapering from at or near the base to the somewhat pointed apex, *light orange before maturity, bright bay* (IV, 5) *when ripe;* skin where loose ochraceous (V, 7), shiny; seed about one-half as long as the fruit, about two-fifths as wide as long, deeply furrowed at base, the ventral channel open; giant cells all rounded (or a few very indistinctly angled), the majority elliptical (1½ to 2 times as long as wide), a few spherical, orange rufous (IV, 13), of nearly the same size and color as in the Deglet Noor (see above)__*Selatny* (p. 93).

Flesh 4 to 6 mm. thick, sugar crystallizing conspicuously on the cut surface; fruit 45 to 50 mm. long, dull orange red before maturity, dark maroon (IV, 2) *to prune purple* (VIII, 1) *when ripe.*

Fruit narrowed from at or near the base to the somewhat pointed apex, skin where loose tawny (V, 1); seed 25 to 26 mm. long, about one-third as wide, more or less truncate at apex, the ventral channel open or partly

closed; *giant cells very small* (resembling those of Deglet Noor and Selatny), *quite uniform in size and shape, all rounded*, spherical or short elliptical, *rarely more than one and one-half times as long as wide, rufous* (IV, 7) *in color*_____*Khalt Horraowia* (p. 82).

Fruit not conspicuously narrowed until from about the middle, broad at apex, skin where loose ochraceous (V, 7), seed 24 to 25 mm. long, about two-fifths as wide, rounded at apex, the ventral channel open or partly closed; *giant cells 3 to 4 times as large as in the preceding, extremely diverse in size and shape, all angled* (generally sharply so), irregularly triangular or quadrangular or angular rod, club, or pear shaped, *often three to four times as long as wide, between saffron* (VI, 4) *and orange* (VI, 3) *in color*_____*Khalt Menakhry*[a] (p. 93).

Oblong Intermediate Soft Dates.

Fruit nearly black when ripe, very soft, not keeping its shape well, 35 to 40 mm. long; *giant cells mostly angular*_____*Tozer Zaid Safra*[b] (p. 85).

Fruit not darker than chestnut (IV, 9) *or maroon* (IV, 2) *when ripe, or, if black, the giant cells all rounded, none angular.*

Fruit black when ripe, very soft, not keeping its shape well, 40 to 45 mm. long; seed about three-fifths as long as the fruit, about one-third as wide as long, between mummy brown (III, 10) and russet (III, 16) in color, the ventral channel open or partly closed, the germ pore above the middle; *giant cells all rounded*, spherical or short elliptical, not more than one and one-half times as long as wide, orange (VI, 3) colored.

Tenaseen[c].

Fruit brown, bay (IV, 5), *or maroon* (IV, 2) *when ripe.*

*Fruit conspicuously wider near the middle than elsewhere and rapidly diminishing in width from that point to the narrow base and apex; seed generally tapering from near the apex to a rather sharp point*_____*Deglet Noor.*[d]

Fruit only moderately wider near the middle than elsewhere and gradually diminishing from that point to the base and apex, or else of about the same width throughout almost its entire length; seed more or less rounded and abruptly tipped (mucronate) at apex, not taper pointed.

Fruit when ripe light hazel (IV, 12) *colored without any tinge of purple*, the skin where loose saffron-yellow (VI, 4), shiny. 47.5 to 50 mm. long, somewhat blunt pointed at the apex, *not keeping its shape well; flesh* about 5 mm. thick, *very soft and sirupy*, with almost no white fibrous lining to the central cavity; seed 23 to 25 mm. long, a little more than one-third as wide, russet (III, 16) to chestnut (IV, 9) colored, the ventral channel open, the germ pore below the middle; *giant cells* quite uniform in size, *mostly rounded* (spherical, short elliptical, or pear-shaped), some quadrangular with rounded angles, none more than one and one-half times as long as wide, orange rufous (IV, 13) to ferruginous (IV, 10) in color.

Deglet Hamidatoo (p. 92).

Fruit when ripe darker colored, bay (IV, 5), *maroon* (IV, 2), *or chestnut* (IV, 9), *with a purple tinge or, if hazel* (IV, 12) *colored and without purple tinge, then of rather firm consistency, keeping its shape well when preserved and with the giant cells mostly angular (Areshty).*

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[a] These four "Khalts" (Mooashem, Deglaowia, Horraowia, and Menakhry) have the skin more or less conspicuously transversely wrinkled as well as blistered, and the flesh, although tender, of quite firm consistency, characters belonging rather to the dry than the soft dates (see p. 96), and they appear to be somewhat related to the Horra variety (see p. 98); but on account of their thick sugary flesh and rich flavor, it seems proper to class them among the soft dates.

[b] The fruit of this variety is usually considerably less than twice as long as wide (see p. 100).

[c] This variety is common in the oases of eastern Algeria. A young palm in the garden at Tempe, Ariz., originally from Ourlana, Algeria, has much shorter, obovate fruit and although labeled "Tenaseen" it is certainly not identical with the above-described fruit, which was obtained in the Oued Souf. The latter is in all probability the true Tenaseen.

[d] This variety has the fruit generally decidedly larger near the base than near the apex and is therefore classed with the ovate intermediate soft dates. The form described on this page is the exception, that on page 104 is the rule.

Fruit when ripe chestnut colored (IV, 9) *with a very slight purple tinge*, the skin where loose tawny olive (III, 17) or ochraceous (V, 7), shiny, *the fruit* bright orange before maturity, nearly 50 mm. long, somewhat pointed and *conspicuously one-sided at apex*, not keeping its shape well when ripe; *flesh* about 4.5 mm. thick, *extremely soft and sirupy;* seed 23 to 24 mm. long, about two-fifths as wide, chestnut (IV, 9) colored; the ventral channel more or less closed, giant cells very diverse in size and shape, all angled (often sharply so), generally considerably longer than wide, triangular, quadrangular, or somewhat pear-shaped, the outlines often very irregular, ferruginous (IV, 10) in color__*Iteema* (p. 89).

Fruit when ripe bay (IV, 5) *or maroon* (IV, 2) *to prune purple* (VIII, 1) (*varying to hazel* (IV, 12) *in Areshty*), *not or not conspicuously one sided at apex.*

White fibrous lining to the central cavity almost none, flesh only about 2 mm. thick, all soft and dark colored when ripe; fruit 45 mm. long, oblong, narrowed slightly at both ends, keeping its shape only fairly well when ripe, bright orange yellow before maturity, maroon (IV, 2) with slight purple tinge when ripe, *skin where loose saffron* (VI, 4) *to orange* (VI, 3), shiny; seed about three-fifths as long as the fruit and about one-third as wide as long, the ventral channel open or closed; giant cells never more and usually less than twice as long as wide, quite variable in form, nearly all angular, in outline triangular, quadrangular, or somewhat pear-shaped; color orange rufous (IV, 13) to ferruginous (IV, 10)__ *Chedakh* (p. 92).

White fibrous lining to the central cavity well developed, flesh at least 3 mm. thick, skin where loose ochraceous (V, 7) *to russet* (III, 16), *rarely orange* (VI, 3).

Flesh soft and sirupy, 4 mm. thick; fruit keeping its shape only fairly well when ripe, 42.5 to 47.5 mm. long, slightly narrowed at both ends, reddish orange before maturity, between dark maroon (IV, 2) and prune purple (VIII, 1) with a conspicuous bloom when ripe, its surface shiny; seed between one-half and three-fifths as long as the fruit, usually slightly less than one-third as wide as long, widest below the middle or about equally wide throughout, the ventral channel open; *giant cells nearly all angular*, similar to those of the preceding (Chedakh); branches of the fruit clusters deep orange_____*Fteemy* (p. 69).

Flesh of firm consistency, fruit keeping its shape well when ripe, broad at base or, if somewhat narrowed at base, the fruit only 40 mm. long, then the flesh only 3 mm. thick and the giant cells all rounded or nearly so.

Fruit 40 mm. long, generally slightly narrowed at both ends, bright maroon when ripe, with considerable bloom; *flesh 3 mm. thick, not very sugary; seed smooth*, 25 mm. long, about two-fifths as wide, widest above the middle, the ventral channel open, the germ pore above the middle; giant cells very uniform in size and shape, all rounded, spherical or nearly so, orange (VI, 3) in color_____ *Khalt Hameed* (p. 89).

Fruit 40 to 60 mm. long, broad at base, flesh 4 to 6 mm. thick, very sugary; seed rough.

Fruit 47.5 to 55 mm. long, oblong or oblong ovate, broad and rounded at base and apex, keeping its shape well when ripe, dull orange yellow before maturity, *between maroon* (IV, 2) *and chestnut* (IV, 9) *or between chestnut and hazel* (IV, 12) *colored* with a purplish bloom *when ripe;* flesh 4 to 6 mm. thick, the white fibrous lining to the central cavity well-developed; *seed* 23 to 25 mm. long, two-fifths to one-half as wide, russet (III,16) to chestnut (IV, 9) colored, *its surface uniformly roughened with small pits and fine wrinkles*, the ventral channel frequently closed, the germ pore usually distinct, always above the middle of the seed; *giant cells quite uniform in size and shape, all rounded*, mostly spherical but some short-elliptical (1½ or nearly 2 times as long as wide), *rufous* (IV, 7) *colored; branches of the fruit clusters lemon yellow.*
Menakher (p. 61).

Fruit dull orange before maturity, light bay (IV, 5) *or light hazel* (IV, 12) *colored when ripe; seed roughened here and there with irregular ridges and furrows; giant cells very diverse in shape and size, nearly all angular, saffron* (VI, 4) *to orange* (VI, 3) *in color; branches of the fruit clusters light orange*_____*Areshty*[a] (p. 71).

[a] The fruit of this variety is generally at least 4 mm. less than twice as long as wide, and it is therefore described more fully under Broad Soft Dates. (See p. 101.)

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PLATES.

DESCRIPTION OF PLATES.

PLATE I. Frontispiece. Harvesting Deglet Noor dates from tall trees at Tozer.

PLATE II. Fig. 1.—An unirrigated tract of alkali land in the midst of Tozer oasis, with a growth of salt-loving samphire, or "pickle weed." Only water is needed to transform this spot into luxuriant date gardens, like those surrounding it. Fig. 2.—Working the soil of a date garden with the "messah," or short-handled hoe, preparatory to planting onions. Illustrates the frequent cultivation given well-cared-for date gardens; also (background), recently planted palms sheltered by tent-like coverings of date leaves.

PLATE III. Date palm (Khalt Aly Meskeen variety) showing the "straddling" of a heavy bunch of fruit to prevent the breaking of the stalks. This is a common practice in the Tunis oases and saves much fruit that would otherwise be lost.

PLATE IV. Fig. 1.—A Tronja palm with numerous offshoots (one as large as the main trunk) in unirrigated alkali land, showing the characteristic curving of the leaves. Fig. 2.—A typical male date palm, showing the characteristic heavy crown of foliage.

PLATE V. Fig. 1.—Menakher palm at Nefta, said to be 20 years old. One of the offshoots shown was imported into the United States. Fig. 2.—Older Menakher palm at El Oudiane, with two large fruiting offshoots.

PLATE VI. Fig. 1.—Deglet Noor palm, oasis of El Oudiane, showing the characteristic drooping of the long-stalked fruit clusters. Fig. 2.—Lagoo palm, showing horizontal or erect short-stalked fruit clusters. Fig. 3.—The town of Nefta, a community supported almost entirely by date culture.

PLATE VII. Fig. 1.—Full-grown Fteemy palms in a hollow, oasis of El Oudiane. Fig. 2.—A plantation of 6-year-old date palms at the edge of Nefta oasis, in land that was formerly covered with an efflorescence of salts. The varieties represented are Fteemy, Okht Fteemy, and Deglet Noor (a Fteemy palm near the center in the foreground). The arrangement of the "lands" for irrigation and a young crop of alfalfa among the palms are shown.

PLATE VIII. Dates, natural size. (1) Deglet Noor variety; (2) Menakher variety.

PLATE IX. Dates, natural size. (1) Tronja variety; (2) Boo Affar variety.

PLATE X. Dates, natural size. (1) Horra variety; (2) Kenta variety; (3) Fteemy variety; (4) Mokh Begry variety.

O

FIG. 1.—ALKALI LAND IN THE MIDST OF TOZER OASIS.

FIG. 2.—WORKING THE SOIL OF A DATE GARDEN WITH THE "MESSAH", OR SHORT-HANDLED HOE.

DATE PALM, SHOWING "STRADDLING" OF FRUIT CLUSTER TO PREVENT THE BREAKING OF THE STALK.

FIG. 1.—TRONJA PALM SHOWING CHARACTERISTIC DROOPING, CURVED LEAVES.

FIG. 2.—A TYPICAL MALE DATE PALM SHOWING NUMEROUS LEAVES.

Bul. 92, Bureau of Plant Industry, U. S. Dept. of Agriculture.

FIG. 1.—MENAKHER PALM WITH NUMEROUS SMALL SUCKERS.

FIG. 2.—OLD MENAKHER PALM WITH TWO LARGE FRUITING SUCKERS.

FIG. 1.—DEGLET NOOR PALM.

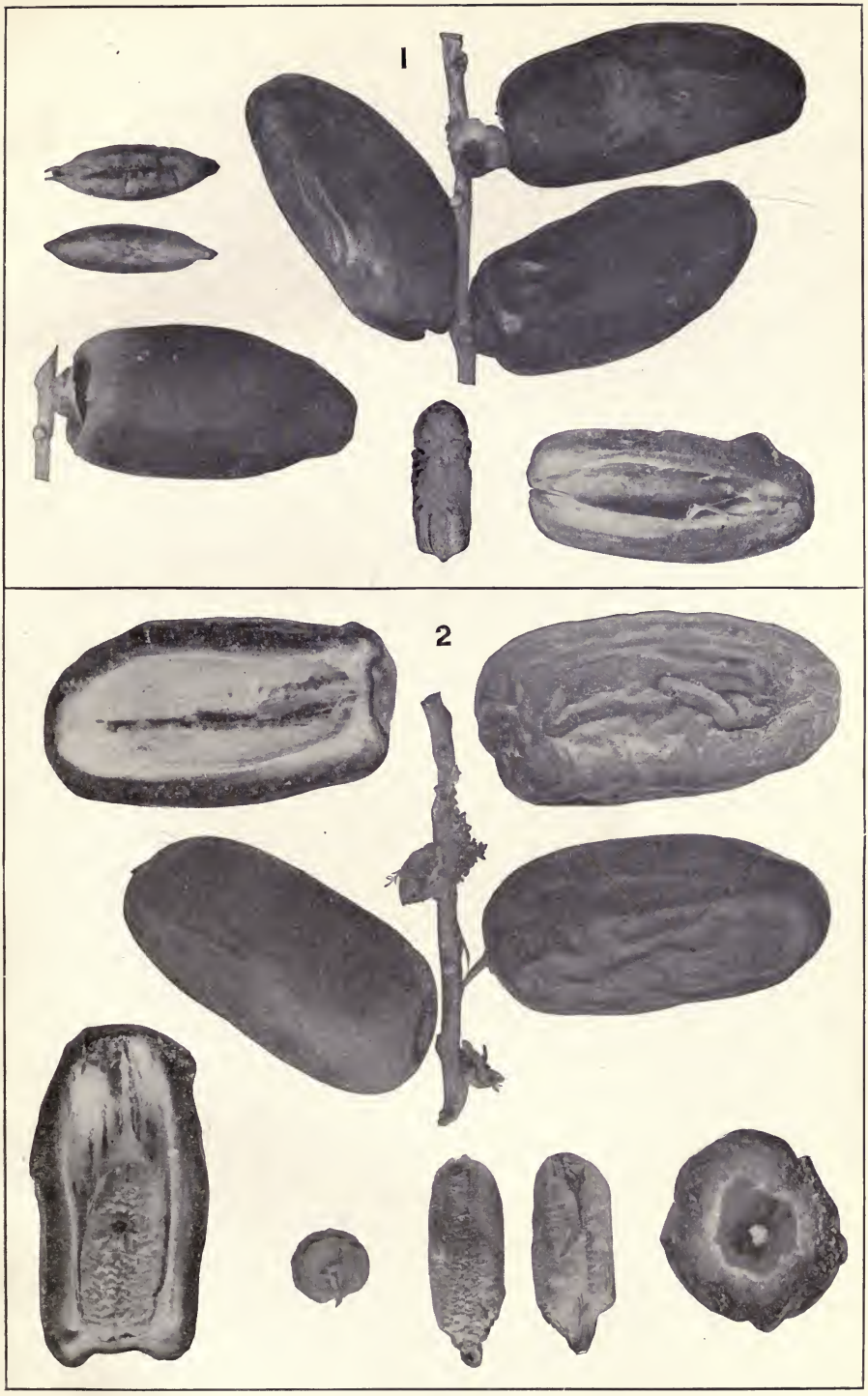
FIG. 2.—LAGOO PALM.

FIG. 3.—THE TOWN OF NEFTA, WITH DATE GARDEN IN LEFT FOREGROUND.

FIG. 1.—FTEEMY PALMS, EL OUDIANE.

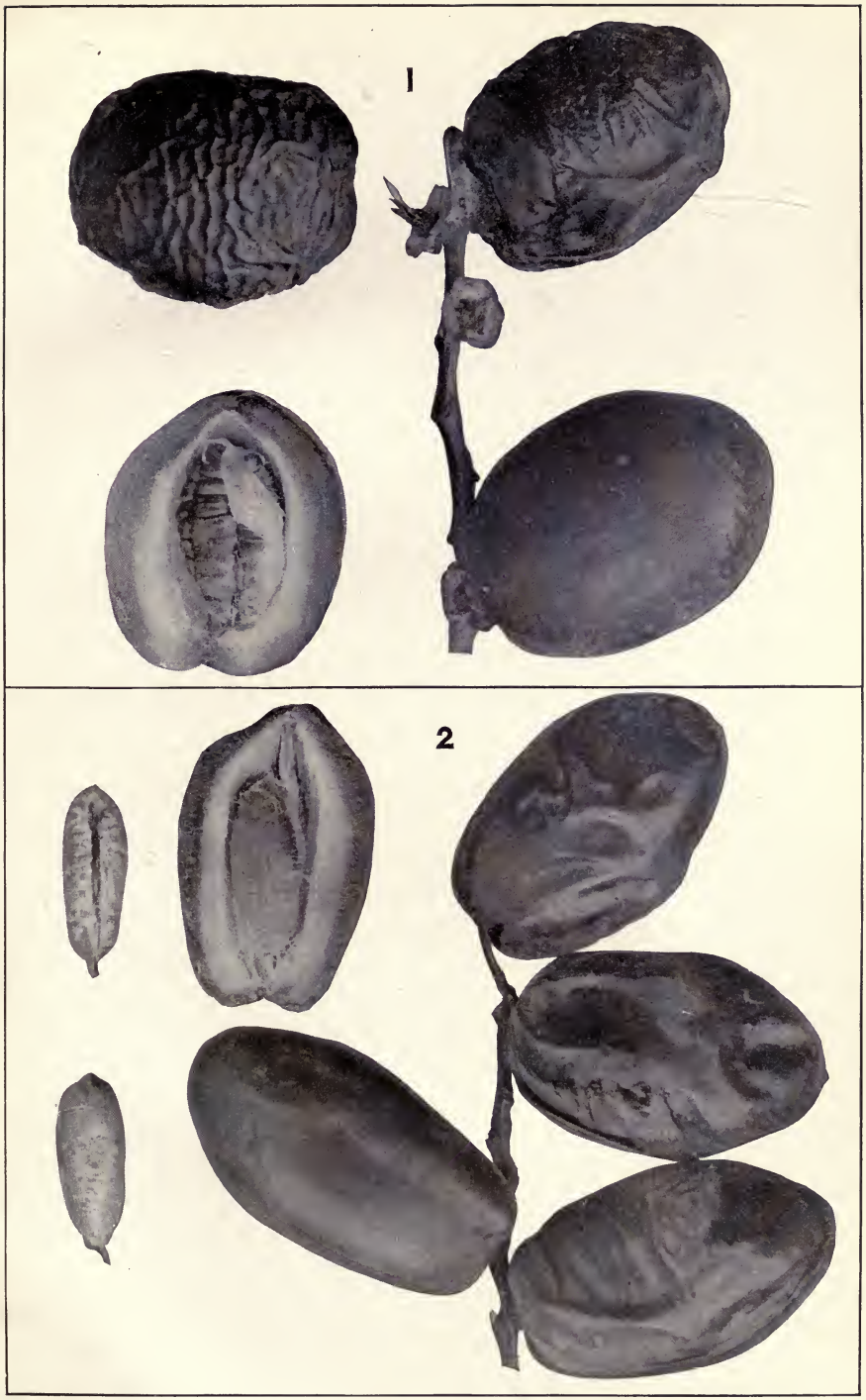
FIG. 2.—PLANTATION OF SIX-YEAR-OLD DATE PALMS AT NEFTA.

A Fteemy palm in the foreground.



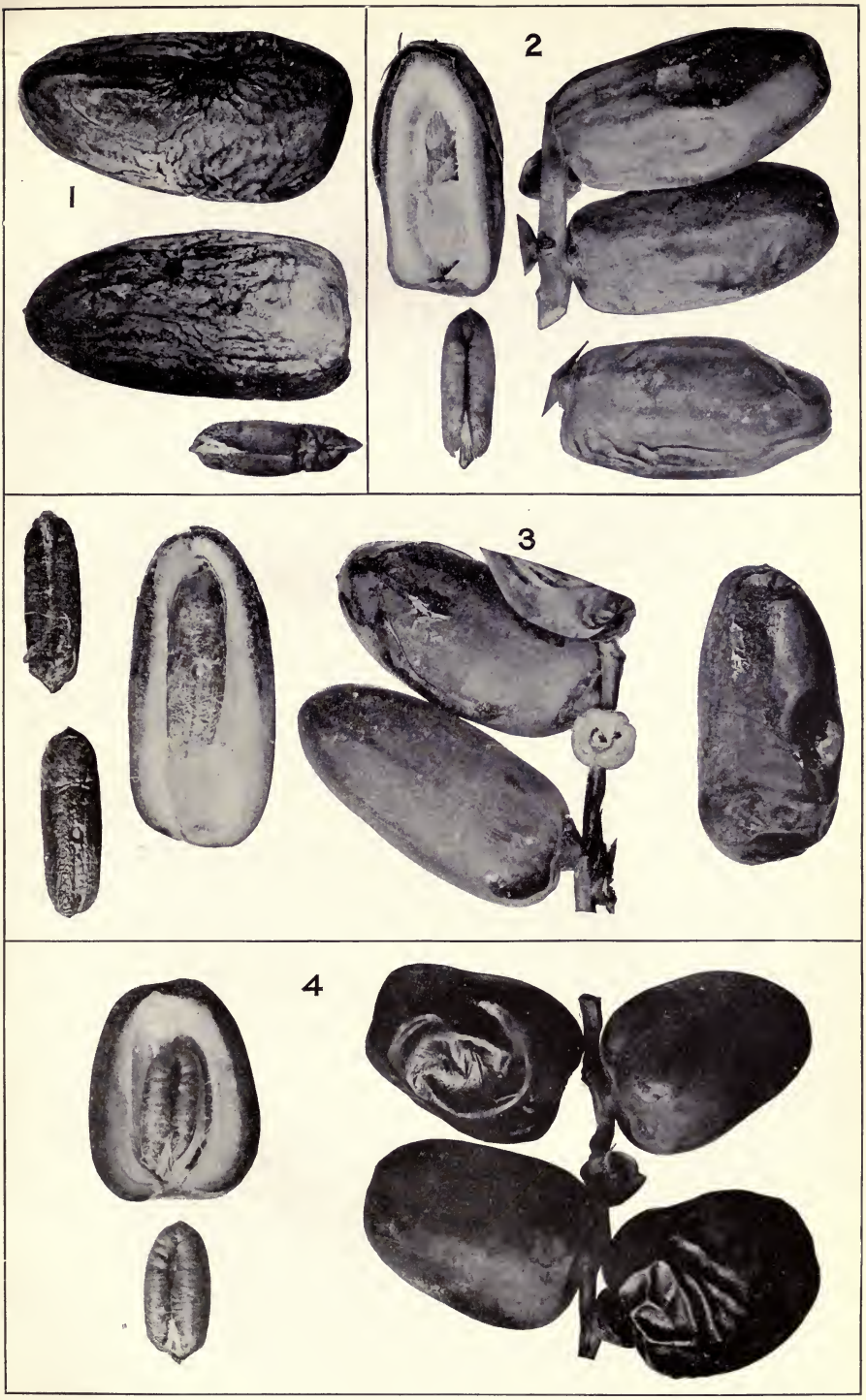
DATES, NATURAL SIZE.

1.—Deglet Noor variety. 2.—Menakher variety.



DATES, NATURAL SIZE.

1.—Tronja variety. 2.—Boo Affar variety.



DATES, NATURAL SIZE.

1.—Horra variety. 2.—Kenta variety. 3.—Fteemy variety. 4.—Mokh Begry variety.

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